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BETTER ER ELECTION

FEBRUARY 1911—SPRAY EDITION



Published by BETTER FRUIT PUBLISHING COMPANY ...Hood River Oregon

Copyright 1910 by Stark Bros.' Nurseries and Orchards Co.

THE
DELICIOUS
APPLE
(½ natural size

Washington Grown

New Mexico

Grown

New York Grown

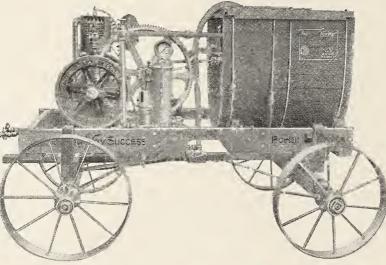
Colorado

Grown

Iowa Grown, from the original tree



the light weight outfit



with the high pressure guarantee

Twin "SUCCE!

IS JUST WHAT ITS NAME INDICATES

Light Weight The first high pressure, light weight outfit that has proven practical for orchards of any size. Speically adapted to hilly or soft ground.

200 Pounds Absolutely guaranteed to keep up 200 pounds pressure indefi-Pressure nitely. No strain on outfit, pump built to give it. 200 pounds pressure is absolutely necessary to produce the highest grade and best quality of fruit.

Twin Cylinder Pump

Twin cylinders cast separately. Constant, steady high pressure. Outside packed pistons. Packing tightened by hand instantly, or replaced in five minutes.

Engine

The "New-Way" air cooled. The high grade quality farm engine. Some outfits furnish the cheapest engines that can be purchased. A cheap engine spoils any sprayer.

The "Special"

The "SPECIAL" is larger, has greater capacity, larger pump, 31/2 H. P. "New-Way" air cooled engine. Built for long continuous spraying in the largest fruit districts.

Catalog

Send a postal for our "Success" or "Special" catalog.

MENTION "BETTER FRUIT" AND ADDRESS



35 ASH STREET STREET 35 ASH LANSING, MICHIGAN, U.S.A.



OR JOHN DEERE PLOW CO. PORTLAND SPOKANE

WHAT HAS THE

NORTHWESTERN FRUIT EXCHANGE

ACTUALLY ACCOMPLISHED?

SINCE ITS ORGANIZATION, JULY 29, 1910
IT HAS SOLD

687 Cars to Buyers in 124 Different Markets

Situated in 29 States, 2 Canadian Provinces, 5 European Countries—Germany, England, Wales, Scotland and Ireland, including 24 different cities in England, 2 in Ireland, 1 each in Germany, Scotland and Wales.

The Widest Distribution Northwestern Fruits Have Ever Undergone Over 90 per cent of all Apples handled were sold F.O.B. Shipping Station

The Exchange is preparing comprehensive statements showing average prices realized f.o.b., for each district, variety, grade and size, separately, and will be glad to furnish this information on application. The results speak for themselves.

The EXCHANGE is a HOME INSTITUTION—controlled absolutely by fruit growers, as well as being directed throughout by fruit growers whose interests are the COMMON INTERESTS OF THE WHOLE INDUSTRY.

The Sales Records of the EXCHANGE are OPEN TO ALL FRUIT GROWERS at all times. The location of the head offices of the Exchange makes it comparatively easy for every fruit grower to familiarize himself with the details of the EXCHANGE'S operations. The EXCHANGE wishes that every grower in the Northwest could spend a few days in its offices, seeing for himself the unremitting CARE with which his business is handled, the scrupulous INTEGRITY of its accounting, the comprehensive SCOPE of its canvass of the markets, the careful JUDGMENT which is the final test of service.

THE EXCHANGE acts as SALES AGENT FOR ASSOCIATIONS. It believes profoundly in the principal of local association, and wishes it distinctly understood that its policy is one of SUPPORT of this principle; also, that it is in thorough accord and perfect sympathy with any and every practical movement which gives promise of betterment to the fruit-growing industry.

Ownership of its stock by bona fide fruit growers' associations, and representation on its Advisory Board, are strong features of membership in the EXCHANGE.

The EXCHANGE invites correspondence from all such associations as believe in its principles and wish to inform themselves further regarding its facilities.

NORTHWESTERN FRUIT EXCHANGE

GENERAL OFFICES: PORTLAND, OREGON

President, REGINALD H. PARSONS (President Hillcrest Orchard Co., 200 acres; Vice President Rogue River Fruit and Produce Association)

Vice President, M. HORAN (President North Central Washington Development League)

Vice President, W. N. IRISH (President Yakima County Horticultural Union)

Secretary, C. R. DORLAND

Treasurer and General Manager, W. F. GWIN (Secretary Kenmar Orchard Company)

IFYOU WANT TO MARKET YOUR

FRUIT

RIGHT

ALWAYS SHIP TO

W. B. Glafke Co.

WHOLESALE FRUITS AND PRODUCE

108-110 Front Street
PORTLAND, OREGON

W. H. DRYER

W. W. BOLLAM

DRYER, BOLLAM & CO.

GENERAL COMMISSION MERCHANTS

128 FRONT STREET

PHONES: MAIN 2348 A 2348

PORTLAND, OREGON

Levy & Spiegl

WHOLESALE

FRUITS & PRODUCE

Commission Merchants

SOLICIT YOUR CONSIGNMENTS

Top Prices and Prompt Returns PORTLAND, OREGON

Correspondence Solicited

RYAN & VIRDEN CO.

BUTTE, MONTANA

Branch Houses:
Livingston, Bozeman, Billings,
Montana
Pocatello, Idaho
Salt Lake City, Utah

Wholesale Fruit and Produce

WE HAVE MODERN COLD STORAGE FACILITIES
ESSENTIAL FOR HANDLING YOUR PRODUCTS

A strong house that gives reliable market
reports and prompt cash returns

The Old Reliable

BELL & CO.

Incorporated

WHOLESALE

FRUITS AND PRODUCE

112-114 Front Street PORTLAND, OREGON

Richey & Gilbert Co.

H. M. GILBERT, President and Manager

Growers and Shippers of

YAKIMA VALLEY FRUITS
AND PRODUCE

Specialties: Apples, Peaches, Pears and Cantaloupes

TOPPENISH, WASHINGTON

FAMOUS HOOD RIVER

APPLES

Spitzenbergs, Newtowns, Jonathans, Arkansas Blacks, Ortleys, Baldwins, Winesaps, R. C. Pippins, Ben Davis, M. B. Twigs

Look Good, Taste Better, Sell Best Grade and Pack Guaranteed

Apple Growers' Union

Hood River, Oregon

Mark Levy & Co.

COMMISSION MERCHANTS

WHOLESALE FRUITS

121-123 FRONT AND 200 WASHINGTON ST.

PORTLAND, OREGON

SGOBEL & DAY

Established 1869

235-238 West Street

NEW YORK

Strictly commission house. Specialists in apples, pears and prunes. Exporters of Newtown Pippins to their own representatives in England

QUALITY QUALITY OUALITY

T. O'MALLEY CO.

COMMISSION MERCHANTS Wholesale Fruits and Produce

> We make a specialty in Fancy Apples, Pears and Strawberries

130 Front Street, Portland, Oregon

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

D. CROSSLEY & SONS

Established 1878

APPLES FOR EXPORT

California, Oregon, Washington, Idaho and Florida fruits. Apples handled in all European markets. Checks mailed from our New York office same day apples are sold on the other side. We are not agents; we sell apples. We make a specialty of handling APPLES, PEARS AND PRUNES on the New York and foreign markets. Correspondence solicited.

200 to 204 FRANKLIN STREET, NEW YORK

LIVERPOOL

NEW YORK

BOSTON

GLASGOW

SIMONS, SHUTTLEWORTH & CO.

LIVERPOOL and MANCHESTER

SIMONS, JACOBS & CO.

GARCIA, JACOBS & CO.

J. H. LUTTEN & SON

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European Receivers of American Fruits

For Market Information Address:

Simons, Shuttleworth & French Co.
204 Franklin Street, New York

Walter Webling 46 Clinton Street, Boston John Brown Brighton, Ontario Ira B. Solomon Canning, Nova Scotia Wm. Clement Montreal, Quebec D. L. Dick Portland, Maine

OUR SPECIALTIES ARE APPLES AND PEARS

Pearson-Page Co.

131-133 Front Street PORTLAND, OREGON

Superior facilities for handling

PEACHES APPLES AND PEARS

Solicit Your Consignments

Reliabe Market Reports Prompt Cash Returns

Ryan & Newton Company

Wholesale Fruits & Produce

Spokane, Washington

We have modern cold storage facilities essential for the handling of your products

Reliable Market Reports

PROMPT CASH RETURNS

LINDSAY & CO. LTD. Wholesale Fruits

HELENA. MONTANA

Established in Helena Quarter of a Century

Branch houses: Great Falls, Missoula and Billings, Montana



Best Service and Protection is Secured by Dealing with Members of the

NATIONAL LEAGUE OF COMMISSION MERCHANTS

OF THE U.S. A.

AN ORGANIZATION OF RELIABLE AND RESPONSIBLE RECEIVERS IN TWENTY-EIGHT MARKETS FOR FREE DIRECTORY OF MEMBERS, WRITE R. E. HANLEY, PUB. MGR., BUFFALO, NEW YORK

Ship Your APPLES and PEARS to the Purely Commission and Absolutely Reliable House

W. DENNIS & SONS

LIMITED

COVENT GARDEN MARKET LONDON

and

CUMBERLAND STREET LIVERPOOL

NEW ORLEANS

The Acknowledged Fancy ruit House of New Orleans

JOBBERS

AUX &

All Fruits in Season

IMPORTERS

Wholesale Commission

PPEL

STORAGE FOR FIFTY CARS

MCEWEN & KOSKEY

Wholesale Fruit and Produce and General Commission Merchants

129 Front Street, Portland, Oregon

CONSIGNMENTS

Are solicited, all your shipments receiving our personal attention

Spitzenbergs & Newtowns

From the Hood River Valley, Oregon

Took the first prize on carload entry at the Third National Apple Show, Spokane, Washington, and Chicago, Illinois, 1910.

The Spitzenberg car scored, out of a possible 1,000 points, 997. The Newtown car, out of a possible 990 points, scored 988.

The Spitzenberg carload also won the championship carload prize at this show.

Can You Beat It?

We have got land improved and unimproved that is growing such fruit that can grow it.

We are agents for the Mount Hood Railroad Company's logged off lands in Upper Hood River Valley. Many started in a small way; today they are independent. You can begin today. It pays to see us. Send today for large list of Hood River orchard land, improved and unimproved, and handsome illustrated booklet.



The above picture shows a prize-winning exhibit of Upper Hood River Valley apples at the Hood River Apple Show

W. J. Baker & Company Hood River Oregon

The oldest real estate firm in Hood River. Best apple land our specialty

The Bond of Confidence

Reflects Upon Every Sale of Irrigated Land at

OPPORTUNITY

IN THE SPOKANE VALLEY, WASHINGTON



A PRODUCING ORCHARD AT OPPORTUNITY, WASHINGTON

OPPORTUNITY is three miles from Spokane, and offers you the greatest opportunity of your lifetime. Here you can own an orchard in the best and nearest fruit district to Spokane and become independently wealthy in a short time.

Now, we want to prove this to you. We want to put you in touch with people who are now making money at **OPPORTUNITY**, and they will tell you all about this wonderful fruit district. We have letters from them printed in our booklet.

Now, LISTEN! OPPORTUNITY is a high class fruit district, with electric lights, telephone service, splendid irrigation system, railroad facilities of the best, and all other conveniences that you could desire.

A great deal of money has been expended at **OPPORTUNITY** to make it the most ideal orchard district in the Northwest, and that's why it is such a great success.

GET THE BOOKLET TODAY

Modern Irrigation and Land Company

P. A. SUMMERLAND, General Sales Agent

326 First Avenue

Spokane, Washington

Gentlemen: Please send on Opportunity.	me booklet
Name	
Address	·····

320 Acre Planted Apple Orchard

FROM ONE TO FOUR YEAR OLD, (STANDARD VARIETIES)

t \$400 to \$500 Per Acre

Can be bought in five, ten or any size tract. Located in the Upper Hood River Valley. Have small or large tracts of improved and unimproved property in the lower and upper valley. Have also ten acres of bearing orchard for sale, located in center of Hood River Lower Valley.

For Full Information Address

G. D. WOODWORTH

HOOD RIVER, OREGON

ARCADIA IRRIGATED ORCHARDS

THE CENTER OF THE RICH WASHINGTON FRUIT BELT

Arcadia is located twenty-two miles from Spokane, Washington. It's a true fruit district—with every conceivable advantage for making money in the fruit business.

Rich soil, gravity irrigation system, excellent railroad facilities, ideal climate.

Our Plan—We plant, cultivate, irrigate and care for your orchard for four years; we pay your taxes for five years. You can remain where you are while we bring your orchard into bearing.

Arcadia is the largest irrigation project in the West. Prices advance January 1st, 1911, so it will pay you to investi-

ARCADIA ORCHARDS COMPANY

HYDE BLOCK

SPOKANE, WASHINGTON

"THE LAND WHERE THE RAIN AND SUNSHINE MEET"

LYLE, WASHINGTON



A YOUNG ORCHARD NEAR LYLE

THE FIRST PRIZE for the best district display of nonirrigated apples was awarded the LYLE exhibit at the SPOKANE NATIONAL APPLE SHOW, 1910. This speaks

FOR BOOKLET AND FURTHER INFORMATION ADDRESS

LYLE COMMERCIAL CLUB

LYLE, WASHINGTON

\$1000

PER ACRE NET



MOSIER APPLES AT HOOD RIVER FAIR

This is not an unusual profit for producing apple orchards in Oregon. It is a perfectly possible profit for any man of persistence and common sense who will select land in a proven apple district in Oregon and develop it properly. If you are at all interested in fruit growing we advise you to investigate the Mosier Valley. This valley adjoins the famous Hood River Valley, and is properly a part of it, so far as the character of the soil and the quality of the fruit produced is concerned. We claim that the apples produced in Mosier Valley are second to none and that there is no section anywhere which offers the fruit grower a greater opportunity. Land in the Mosier Valley can be obtained for very low prices, and can be cleared with comparatively little effort. These lands can be made to increase in value from 100 to 500 per cent in two years by clearing and planting trees. We invite the most careful and critical inspection of Mosier Valley, confident of the outcome. For full particulars about this Valley address

SECRETARY MOSIER VALLEY COMMERCIAL CLUB

MOSIER, OREGON

WHITE SALMON VALLEY

NON-IRRIGATED

Having direct water TRANSPORTATION, after the Panama Canal is built, it is estimated that White Salmon and Hood River Newtowns can be put on the English market for 35 cents a box.

At the Third National Apple Show, where four carloads scored higher than the highest car last year, Hood River won Grand Championship Prize on Spitzenbergs and first prize on Yellow Newtown car. Two years in succession Spitzenbergs have won this prize. These two apples, Spitzenbergs and Newtowns are our specialties.

White Salmon, being just across the Columbia from Hood River, belongs to this world famous apple section of the Cascade Highlands.

Other places of the Northwest are also profitable for orchards, but in these highlands is the place to live and enthuse, as well as to make money.

White Salmon, being a comparatively new orchard section (opened by the recent construction of the North Bank R. R.), there are great opportunities for investment.

Development League

WHITE SALMON, WASHINGTON

White Salmon Realty is a Good Investment



Spitzenberg
WITHOUT IRRIGATION

What Eastern
Commission Men Say
About Non-irrigated

APPLES

"Your non-irrigated apples are unexcelled by even the fine apples of Hood River, and the White Salmon growers should get the very top price for their fruit in the markets of the East. This is certainly a coming apple district."—Wm. Crossley, of the firm of D. Crossley & Sons, apple exporters of New York.

White Salmon offers greater advantages than any other apple district. Why? Because there is more unimproved land to be had, at a cheaper price and on easier terms.



Yellow Newtown
WITHOUT IRRIGATION

IF YOU ARE LOOKING FOR FRUIT LAND THAT RAISES THE ABOVE DESCRIBED FRUIT, IN ANY SIZE TRACTS, IMPROVED OR UNIMPROVED, CALL ON OR ADDRESS THE

CONSOLIDATED REALTY COMPANY

WHITE SALMON, WASHINGTON

Irrigated Rogue River Valley



ROGUELANDS IRRIGATED ORCHARD TRACTS

OREGON ORCHARDS ARE THE MOST FAMOUS IN THE WORLD

ROGUE RIVER VALLEY IS THE BEST ORCHARD DISTRICT IN OREGON

> SOLD ON SMALL MONTHLY OR ANNUAL PAYMENT PLAN

The Rogue River Valley has made the apple king. It has won the national prizes at the greatest shows ever held in America. It has received the highest prices ever paid for fruit in the New York and London markets. It has been declared by government experts to be the most perfect fruit belt in the world, and has proven beyond the question of a doubt that it will be the most important fruit section in the entire country. The development of orchard tracts is very profitable. You can

make \$1,000 per annum on a five-acre tract while your orchard is coming into bearing. You can clear \$500 per acre when your orchard is developed. We will sell you a five-acre irrigated orchard tract in the very heart of this wonderful orchard country, with splendid railroad facilities, near the prosperous city of Medford, planted to standard varieties of apples or pears, at \$350 per acre; \$350 cash, balance covering a period of four years. Orchards cared for during a period of five years or turned over at once to the purchaser.

Let us tell you all about the glorious country of Southern Oregon and the wonderful orchards that have made this valley famous. Write for our literature. Our references: Bradstreets and R. G. Dun.

ROGUELANDS, INC.

FRED N. CUMMINGS, MANAGER

MEDFORD, OREGON

Cheap Hood River Apple Lands

Arable tracts of first-class apple land can be bought for prices as low as \$50.00 an acre, easy terms. We have good offers to make in Underwood, White Salmon and Lyle, the famous Columbia River non-

Unimproved land in Underwood \$150.00 an acre, one mile from station on North Bank R. R.; red shot clay soil; no rock; light timber and brush; cost of clearing \$50.00 to \$80.00 an acre. Wonderful view of Mt. Hood and Columbia River Gorge. Improved bearing orchards, 5 to 40 acres.

JOHN LELAND HENDERSON, Inc.

J. L. Henderson, 600 Chamber of Commerce.

Hood River, Oregon

HOW YOU CAN SECURE AN ORCHARD AT WILL PAY FOR ITSELF

These orchards are located in the deep volcanic ash fruit soil of the great Columbia River Basin, less than 100 miles from Portland, Oregon, near Mount Hood and the famous Hood River Valley, with railroad depot on the property.

If you are interested, and have a little money, write, today, for full information in regard to this opportunity, the like of which you will not have again soon, and for "How I Can Secure an Orchard That Will

DUFUR DEVELOPMENT COMPANY

91 Third Street

PORTLAND, OREGON

SPITZENBERGS

WINESAPS



Three-year-old Spitzenberg in Rogue River Valley

ROGUE RIVER VALLEY

Best medium climate in the United States Best values for the least money

THE 25-ACRE TRACT of which this picture shows a portion is now four years old. Elegant Spitzenberg and Newtown Pippin trees, some of which are from ten to twelve feet high, showing a body five inches in diameter. Also contains about 2½ acres of the best one-year-old commercial pears. This is close to the beautiful Rogue River, which affords elegant fishing and boating. Entire tract is deep, free, river bottom loam soil, along a level county road, only about four miles from town, in the best bearing orchard district. This is the BEST YOUNG COMMERCIAL ORCHARD ON THE MARKET here. Can be bought for a short time, either as a whole or divided, at \$500 PER ACRE, on reasonable terms. If you want it you will have to hurry.

Also have a choice list of other tracts of all descriptions.

Elegant prospects for much additional railroad development here this season.

For full information regarding this and other tracts, write or call on

A. N. PARSONS, Grants Pass, Oregon

References by permission: First National Bank, Grants Pass Banking & Trust Company.

APPLES **PLUMS** PEARS **PEACHES** PRUNES

WHITE SALMON VALLE THE LAND OF

Located across the Columbia River from Hood River, Oregon, the White Salmon Valley offers the greatest opportunities of any land on earth to fruit growers.

WHERE APPLES, CHERRIES, PEACHES, PEARS, PRUNES AND STRAWBERRIES GROW TO PERFECTION

A few dollars invested in fruit land today will return to you in a very few years sixty-fold. The SOIL, CLIMATE, WATER and SCENERY are unsurpassed by that of any country. We have bargains in orchard lands in and near White Salmon, also large and small bodies of

timber land, cheap. WRITE US FOR DESCRIPTIVE MATTER AND PRICES

ESTES REALTY & INVESTMENT CO.

White Salmon, Washington

BERRIES

CHERRIES

STRAWBERRIES

NUTS

OREGON IS THE PLACE FOR ME"

PORTLAND COM	MERCIAL CLUB
Portland,	Oregon

Send me specific information about what Oregon has to offer

- O Apple Orcharding
- (Hotels
- O Pear Orcharding
- O Resorts
- O Peach Orcharding
- () Schools O Railroads
- OPrune Orcharding O Live Stock Raising
- O Towns
- O Poultry Raising
- O Mining
- O Truck Farming
- O Manufacturing
- O Walnut Culture
- O Water Power
- Wheat Growing
- O Merchandising
- O Dairying
- O Berry Growing
- O Timber

That's what you'll say when you learn specifically just what opportunities Oregon can offer you in your own line of endeavor.

The Portland Commercial Club will lend you all the assistance within its power to make you thoroughly acquainted with the possibilities Oregon offers you in your own line. It will tell you specifically what inducements different sections of the state are offering.

In manufacturing—in dairying—in agriculture—in fruit raising—and all other lines, Oregon offers splendid opportunity for great and successful achievement.

Take out your lead pencil or pen—look down the list of industries, and in the little circle opposite the business that interests you most, make a mark, clip out the list and mail it in. In return you will receive valuable and specific information regarding those sections of Oregon peculiarly adapted to your special line. Write a personal letter. Ask questions that come into your mind. They will all be answered fully and comprehensively. Check the list now while you have it in mind.

Portland Commercial Club Portland, Oregon

OKANOGAN IRRIGATION AND IMPROVEMENT CO.

Capital Stock, \$500,000

Project in the very heart of the justly famous fruit belt of Okanogan County, Washington.

Over 15,000 acres of irrigated land below the high line ditches of this Company.

Ten thousand acres of land now under contract, and as much more available for irrigation.

Two thousand square miles of water shed on mountain streams furnish an abundant supply of water.

Reservoirs with storage capacity for twice as much water as needed for reserve supply in seasons of possible drouth.

No Better Fruit Land in the State of Washington

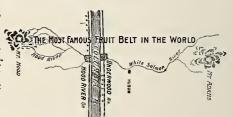
A small block of stock for sale at \$75 per share, par value \$100. Details of plan to furnish choice fruit land with perpetual water right for less than \$100 per acre will be furnished on application to the Spokane office of the Company, 518 Paulsen Building.

Read descriptive article elsewhere in this issue of "Better Fruit'

UNDERWOOD

The Gateway to the Famous White Salmon Valley

If you want a strictly first-class location for growing highgrade fruit, close to the river and railroad, within sight of the town of Hood River, with the best of everything in the way of shipping and social advantages, call on or write



W. F. CASH, UNDERWOOD, WASHINGTON

G. Y. EDWARDS & CO.

HOOD RIVER, OREGON

Our Specialties:

Fruit Lands, Orchards and Raw Lands

Get our literature and list of orchards

WRITE US FOR PARTICULARS



ASHLAND DISTRICT ROGUE RIVER VALLEY

Orchards near the City of Ashland, Oregon, hold the highest records for productiveness per acre, in comparison with all the other orchard localities of similar size.

A booklet descriptive of the many resources of this city and the surrounding country will be sent free on applying to the Publicity Department of the Ashland Commercial Club, Ashland, Oregon.

HOOD RIVER

Makes New High Records

- In competition with twenty-two cars from Northwest Apple Districts. Won Sweepstakes and \$1000 cash prize.
- In competition with four cars Spitzenbergs. Won Best carload of Spitzenbergs and \$250 cash prize.
- In competition with four cars from Northwest Apple Districts. Won Best carload Newtowns and \$250 cash prize.
- Won Association of Chamber of Commerce of Chicago, \$500 Silver Cup for Best Packed Car.
- At Portland, in competition with State of Oregon, Hood River won nearly every entry in one, two, three order.

This only proves our claim of ten years standing—HOOD RIVER is the quality fruit district—the ideal location for you

FOR FURTHER INFORMATION WRITE THE

Secretary, Hood River Commercial Club, Hood River, Oregon



The HEATER THAT MAKES GRAND VALLEY FAMOUS

Millions of dollars worth of fruit has been saved by Ideal Coal Heaters. Big crops were saved when the temperature fell as low as 16 above zero in blooming time. Sixty-five thousand Ideal Coal Heaters were used in Grand Valley alone. Many thousands are sold for spring delivery. Our Jumbo Ideal burns all night without refilling. Ideals are reservoir coal heaters, self-feeding and self-cleaning. You pay for Ideals no matter what heater you use. If you use none you pay for Ideals many times. Better use them. We have sold many of our old customers heaters this year.

QUICK HEAT GREAT OUTWARD RADIATION

GREAT VOLUME

BIG CROPS SAVED

VERY SMALL EXPENSE

Send 50 cents for sample. Reliable agents wanted. Write today.

The Ideal Orchard Heater Co.

Grand Junction, Colorado

Stranahan & Clark

DEALERS IN

Commercial Fertilizers
Land Plaster, Lime
Plaster Paris, Cement
Building Plasters
HOOD RIVER, OREGON

The PARIS FAIR

Hood River's largest and best store

DRY GOODS SHOES, CLOTHING

We are offering some extra specials in our Clothing Department. Ask to see them.

Try a pair of American Lady \$3 and \$3.50 Shoes, or American Gentleman \$3.50 and \$4 Shoes

THINGS WE ARE AGENTS FOR

KNOX HATS
ALFRED BENJAMIN & CO.'S
CLOTHING

DR. JAEGER UNDERWEAR
DR. DEIMEL LINEN MESH
UNDERWEAR

DENT'S and FOWNES' GLOVES

Buffum & Pendleton

311 Morrison St., Portland, Oregon

SCOTT-MUNSELL IMPLEMENT CO.

321-329 East Morrison Street, Portland, Oregon

1018-1020 Sprague Avenue, Spokane, Washington

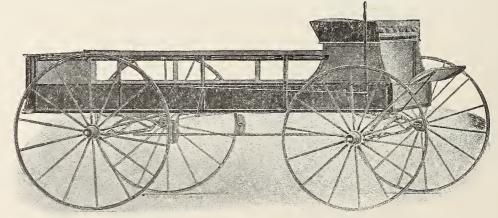
WHOLESALE AND RETAIL DEALERS IN

Vehicles and Implements

Carry large assortment of best styles of earth-working tools; also having and harvesting machinery; also wagons for fruit delivery and for teaming; also driving vehicles for business and for pleasure uses.

WE RECOMMEND TO FRUIT GROWERS THIS WAGON NO. 120 MADE BY FREMONT CARRIAGE MANUFACTURING COMPANY

Bodies
42 inches
wide.
Have drop
end gate
with chains.
Hang low
on duplex
springs.



Uses the celebrated
"Fitch Gear"
"Short Turn"
with
high wheels,
wide body
hung low.

Sizes: 11/8-inch, 11/4-inch, 13/8-inch and 11/2-inch axles. Bodies: 7-foot, 8-foot, 9-foot, 10-foot; 42 inches wide

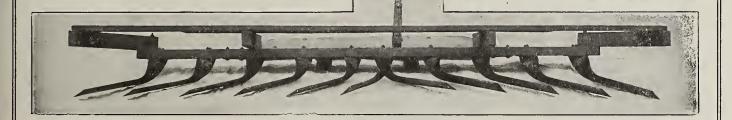
THE NAME OF MAKERS IS GUARANTEE OF HIGHEST QUALITY

KIMBALL CULTIVATOR

Great Weeds and Ferns Exterminator

Ninety Per Cent Hood River Orchardists Use This Machine





Hood River, Oregon, February 26, 1910

Mr. W. A. Johnston, The Dalles, Oregon

Dear Sir: I use three "Kimball Cultivators" in my orchard. There is nothing better as a weeder, dust mulcher, or to stir the soil.

Yours truly,

E. H. Shepard, Editor "Better Fruit"

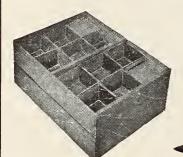
W.A. JOHNSTON, Manufacturer

Office and Factory, 811 East Second Street, The Dalles, Oregon

Long Distance Phone, Main 3671

"NATIONAL" FOLDING BERRY BOXES

ALL STANDARD STYLES AND SIZES WITH CRATES TO MATCH



National Lumber & Box Co.

HOQUIAM, WASHINGTON

Manufacturers of Every Known Style of Fruit Package

BEST



For Filling





For Simplicity

OUR AGENTS

MULTNOMAH LUMBER & BOX CO. PORTLAND

H. J. SHINN & CO. SPOKANE

RYAN, NEWTON & CO. SPOKANE



For Shipping

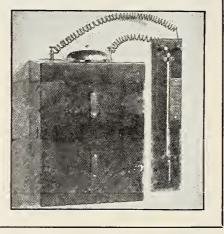
BEST BERRY PACKAGE EVER PRODUCED

Have Your Own Weather Bureau

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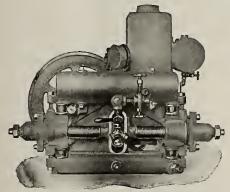
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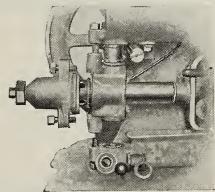
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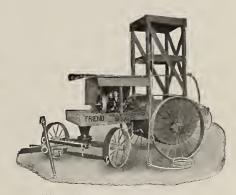
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cash, balance 7% interest.

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\$5,000 cash, balance on or before five years at 7%.

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20 acres 7½ miles southeast of Hood River; red shot soil, good drainage, and all under the ditch; 4 acres in Spitzenbergs and Newtowns one year old; 12 acres slashed and burned, balance in fir. Price \$5,000; \$2,000 cash, balance on or before five years at 7%.

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A MONTHLY ILLUSTRATED MAGAZINE PUBLISHED IN THE INTEREST OF MODERN AND PROGRESSIVE FRUIT GROWING AND MARKETING

SPRAYING FOR CURCULIO AND CODLING MOTH

BY ESTES P. TAYLOR, MISSOURI STATE FRUIT EXPERIMENT STATION, MOUNTAIN GROVE, MISSOURI

HE name plum curculio was given this insect from its having been observed in early days as a very serious pest of the plum. It is a very old insect in this country, having been mentioned in literature as a pest more

than a century ago.

Not only is its injury notorious upon plums, cherries, peaches, nectarines, apricots and other stone fruits, but it attacks the apple, pear and quince, and of native food plants it is to be found upon wild plums, crab-apples and hawthorne. Dr. C. V. Riley, the first state entomologist of Missouri, studied the insect in this state, publishing many of the details of its life history in 1869. It was even as early as this date that he recorded it as injurious to apples. Thus it has been known as an apple pest in Missouri for forty years. It seems to have been especially destructive here on this fruit about ten years ago, as noted by Dr. J. M. Stedman in his excellent bulletin upon "The Sting in the Apple," published in 1904, and has evidently grown even more destructive in recent years. In some sections of the state, notably along the Mississippi River and in parts of the Ozarks, it has been found by the writer to cause greater damage to the apple crop than the codling moth, and if the insect is considered from the standpoint of its damage to all fruits it is unquestionably responsible for greater financial loss to Missouri horticulture than any other insect present.

Most orchardists are familiar with the appearance of the adult. It is well illustrated in Fig. 1, where its different stages are also shown. It is a grayish-black "snout-beetle" measuring one-fifth inch in length and bearing two prominent humps and several smaller elevations upon its back. The beetles are not easily seen upon the trees, requiring very close observation to find them. They have the habit of other snout-beetles of dropping to the ground when disturbed and feigning death or "playing 'possum," as it is expressed. Some orchardists take advantage of this characteristic and capture them by jarring the trees in the early morning over sheets or "curculio catchers." The beetles pass the winter hiding about the orchard, in adjoining timber, beneath the rough bark of trees and in other places of concealment. In the spring, following the blooming of fruit trees, they emerge from hiding quarters and soon begin making their

punctures upon the fruit. Peaches, plums and cherries, being earlier to set fruit, are usually attacked first. Apples are stung first when about the size of peas or a little larger. Two kinds of injuries are made by the beetle, the round opening through the skin made in feeding and the small crescent or half-moon shaped marks made partially surrounding the pit, where the egg has been previously laid. Sometimes the beetles feed sparingly upon the foliage, eating small holes in the leaves.

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The eggs hatch in from five to ten days into a tiny grub, which begins at once to bore minute channels through the tissue toward the core or in irregular tunnels leading through the flesh. The larvac are yellowish white in color with a light brown head. They are footless grubs, rarely exceeding one-third of an inch in length when fully grown. With these characters in mind they need never be confused with the larvae of codling moth.

From three to five weeks are required from egg-laying to emergency of the larvae from fruit. The pupa is formed in an earthen cell rarely deeper than two inches, and occasionally just beneath the earth's surface. If undisturbed five or six more days are spent by the larvae in its earthen cell before transforming to pupa, and from five to ten days are spent as pupa. From two to four weeks are spent from the time the larvae leave the fruit to the time the new adult beetle appears above ground, and from fifty to sixty days represents the average length of time spent in the summer

for their complete development. These periods may vary somewhat with the moisture, temperature and other conditions. There is but a single generation throughout the year, the beetles which mature during the summer making some food punctures in the fruit before going into hibernation, but not laying eggs nor doing their principal damage in feeding until they emerge from hibernation the following spring.

Apple growers will be interested in the dates at which the different stages of curculio may appear in the orchard, since it is upon this that the spraying operations depend. Arbitrary dates cannot be depended upon from year to year on account of variations in weather conditions, nor can they be expected to exactly correspond for all parts of the state the same year. Comparisons of time of development of the insect with that of the fruit is consequently of much greater value.

In 1908, at Olden, a point in the Ozarks, at an elevation of about 1,200 feet, no adult curculio could be jarred from apple on April 20. At this date the calyces of Jonathan were well formed tubes, and Ingrams, a late blooming variety, had shed more than one-half of their petals. However, at this time beetles were to be found quite abundantly upon peaches and plums. A single beetle had been taken upon plum April 1, nearly three weeks earlier. A few egg and food punctures were found on May 5 upon apples which measured from one-fourth to one-half inch in diameter. From the time apples measure one-third inch in diameter to when they reach the size of walnuts the maximum number of both food punctures and egg crescents are being made in them, a fact which should be borne in mind in directing sprays, especially against the curculio.

In unsprayed orchards a slight increase in feeding punctures may be noticeable generally late in June or early in July, due to the emergency of the new generation of beetles. These new adults, however, feed rather sparingly in the late summer, much less voraciously than did their parent beetles in the spring, and with less appetite than they themselves will show the following spring.

Under normal conditions, where the over-wintering adults are not destroyed by orchardists, they may also feed and deposit eggs much later than indicated

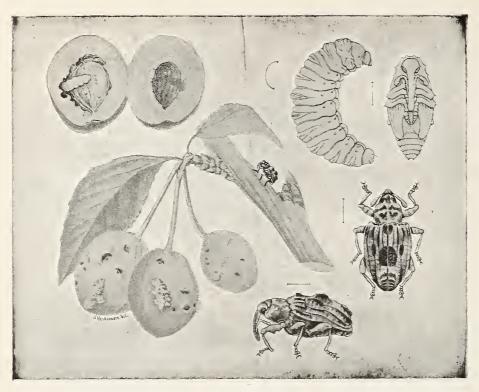


FIGURE 1—CURCULIO, ADULT AND EARLY STAGES; PLUMS SHOWING CHARACTERISTIC MARKINGS, WITH GUM EXUDATION. (After Lugger)

A number of over-wintering beetles were caught by the writer April 20 and confined in cages with food. One pair remained living up to August 1, a period of 103 days from capture, bringing about an overlapping of spring and fall beetles. A single female beetle under observation by the writer deposited 155 eggs extending over a period of 101 days. Neither of these records are especially exceptional. The last of August in south Missouri and the last of September in the northern part of the state will find practically all of the beetles dead and the new ones in hibernation. The last beetle jarred from apple at Olden in 1908 was on August 14, when a single specimen was found. This was nearly two months before the late apples were picked



FIGURE 3—APPLES GNARLED FROM EFFECTS OF CURCULIO PUNCTURES (After Washburn, Bulletin 112, Minnesota Agricultural Experiment Station)

The injury to the surface of apples from this insect may result from the feeding punctures made by either sex or by the crescent punctures of the female. These blemishes in the skin damage the appearance of the fruit and reduce their quality and market value. The feeding punctures greatly outnumber the egg crescents. A certain percentage of the miniature apples are made to drop very early from the effect of these "stings," especially those in which the eggs hatch.

The plum curculio does not multiply readily in apples, and only a small percentage of the eggs deposited ever hatch. No larva develops to maturity in an apple which remains upon the tree. The larva boring its tortuous channel through the tissue brings the apple prematurely to the ground. If the egg hatches and

the larva perishes after boring a short distance into the apple the fruit may remain upon the tree, but becomes badly gnarled and misshapen. In these cases the crescents and the openings into the larva burrows appear at the bases of deep depressions and the tissue along the burrows is!

changed to a greenish color and made tough and woody.

Feeding punctures made early in the growth of the apples sometimes appear later only as "specks" upon the surface and arc not so objectionable as those made later. The early feeding punctures of the curculio are generally very hard to distinguish from the specks made by the codling moth larva, neither of which injure the keeping quality of the apple, nor do they detract in any great degree

from its appearance. One of the greatest losses to orchardists, due to curculio, is from the rots and fungus diseases which gain an entrance into the apple through open punctures made by these insects.

One may appreciate the capacity of the curculio for doing evil when the number of punctures capable of being made by a single pair of beetles is considered. A single male and female kept in a cage for over three months and supplied with fresh fruit made a total of 721 separate egg or food punctures. Had they been distributed singly in the apples in the orchard 4.8 bushels of apples, estimating 150 per bushel, could have received punctures from this single pair.

Orchardists who have seen apples covered with scores of such curculio food and egg punctures as shown in Fig. 2, or perhaps gnarled and knotted as shown in Fig. 3, or who have seen a majority of their apples fall to the ground as windfalls and the balance upon the trees gnarled and stung so badly by this insect as to render them completely unmarketable, need no further recital of the importance of this pest, and the present need of spraying and other control measures.

Briefly stated, the life history of the codling moth is as follows: The insect passes the winter as a worm within a tough silken cocoon, under rough bits of bark, under boards or piles of rubbish, in barrel or box material in fruit packing houses, or hidden away in various nooks and crevices about the trees. In the spring, as the warmer days come, these worms change to a brown pupae or chrysalids within the cocoons. Those upon the sunny side of the tree trunks or in the warmer locations are the first to transform. In a short time these pupae vield the moths, which, after mating, begin to deposit their eggs upon the trees—the eggs during the early egg-laying period being placed upon the upper or smooth surface of the apple leaves, but invariably upon those leaves which are borne close to fruit. Fruit growers are only oo familiar with the appearance of the larva as it passes the winter or as it is found within the wormy apple. Most fruit growers are also able to recognize the pupae and the moths. These are shown in Figs. 4 and 6 and a wormy apple in Fig. 5. Orchardists are, however, less familiar with the eggs, though every fruit grower should be able to discover and know them when they

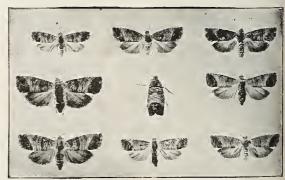


FIGURE 4—ADULT CODLING MOTHS, NATURAL SIZE (From Slingerland, New York (Cornell) Agricultural Experiment Station, Bulletin 142)

appear. They are illustrated upon fruit in Fig. 7. They are somewhat smaller than the head of a common pin, nearly circular in outline, slightly convex and when laid are stuck down tightly upon the surface. Without closer examination they look like minute drops of milk or specks of spray. It requires very close search to discover them, though it is sometimes possible, by turning the leaf or apple in the sun in a certain way, to make the tiny glistening egg very conspicuous. When first laid the eggs are of milky-white color. About three or four days from deposition they show the body of the larva as a reddish ring within them, and at about the fifth or sixth day the black head of the embryonic larva shows as a black spot near the center of the egg. At about the seventh day from laying codling moth eggs usually hatch. The eggs from the spring moths begin to appear when the apples are about half an inch in diameter, though at this time they are laid only upon the smooth surface of the leaves near the fruit. As soon as smooth patches appear upon the little apples, eggs may be found upon the fruit itself, and from this time forward the proportion of eggs laid upon the fruit increases. Occasionally eggs are deposited upon portions of twigs bearing apples.

The young larva upon emerging from the egg crawls about over the surface of leaves or fruit for a short time, where it sometimes feeds sparingly, then enters the apple. A majority of these first generation worms enter the apples at their calyces. At least two-thirds of the early worms enter at this point, some writers placing the ratio of calyx worms much higher from the early generation, and from counts made by the writer in Missouri last summer, 72% showed apples with worm holes at the calyx. Some of these had also holes at the side or stem, evidently made by the same larva. The larvae bore their way into the fruit push-

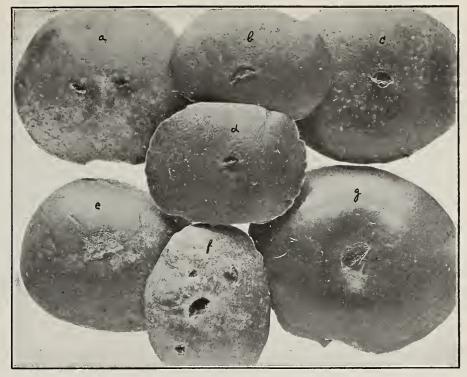


FIGURE 2—PORTIONS OF APPLES, ENLARGED TWO AND ONE-HALF TIMES, SHOWING
"STINGS" AND SCARS FROM CURCULIO

(From Stadman Bulletin 64 Miscouri Agricultural Experiment Station)

(From Stedman, Bulletin 64, Missouri Agricultural Experiment Station)

ing back to the opening of their burrows bits of brown voidings which appear upon the surface. They finally reach the seeds, often devouring them and much of the tissue at the core. Upon an average about 17 days are spent by these larvae within the fruit when they push the plug of brown dust from the opening into the burrow and crawl out. The full grown worm crawls to a place of concealment, where it spins a light cocoon and after a few days transforms to pupa. About two weeks are spent within the cocoon—about four days as larva and ten as pupa—when the second genera-

tion moth emerges. The moths again mate and lay eggs, which produce the second generation of worms. They very greatly outnumber those of the first generation, and so in unsprayed orchards their damage to fruit is correspondingly greater. In Southern Missouri, at least, there is a third generation of worms. In the fall, after attaining their growth, the worms leave the apples and spin their tough winter cocoons, within which they remain as larvae until spring.

The codling moth, as will be seen from what is given, passes through two, and in parts of the state, three, complete generations in Missouri each year. For the summer generation from six to seven weeks is the average length of the total life cycle.

In connection with life history observation several important dates at which the changes of the insect took place at Olden in 1908 will be of interest, though the dates would probably be some weeks later for points in Northern Missouri, and, as stated in referring to the curculio, weather conditions from one year to another will make the dates of changes somewhat variable.

The first hibernating larvae which was found changed to pupae in the orchard at Olden were on April 6, and the first moth was seen in the orchard May 5. At this date the first few scattering eggs were found on apple leaves of early blooming varieties. The first eggs were found hatched on Ingrams, May 23, when this variety measured about one-half to three-quarters inch in diameter. The maximum hatching of eggs did not take place for ten days to two weeks following, and a few stragglers were entering the apples well into the month of June. The dates at which the first generation larvae enter apples has a very important

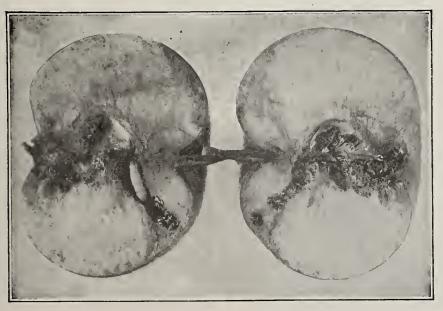


FIGURE 5—MATURE APPLE CUT OPEN, SHOWING APPLE WORM AND ITS WORK Somewhat reduced. (After Quaintance, U. S. Department of Agriculture Year Book, 1907)

bearing upon the times of sprays, as will be seen later.

A few apples were found with worms escaped by June 11, and larvae preparing to pupate were first caught under burlap bands on trunks June 16. From this date forward almost up to the time the apples were picked in October, larvae continued beneath the bands. Before all the larvae of the first generation had left the apples there were some of the earliest maturing of the second generation worms fully grown and leaving the fruit, thus bringing about an overlapping of generations difficult to separate.

The first moth of the second generation was secured on June 29, and a number of others were secured during the first week of July. Early in July the first of the second generation eggs were to be found, though the maximum number did not appear for some weeks later. Moths were reared from cages. kept at approximately outdoor temperature, as late as September 4, and there is little doubt that moths were present in the orchard at even a later date, for when the Ingram apples in the check block of the experiment were picked the first week in October, there were a few very small, sluggish larvae of codling moth to be found in the fruit, retarded in their development by the cold autumn nights. Indeed, on October 7th, while the apples were being examined, what seemed to be a single freshly deposited codling moth egg was found attached to an apple. This specimen was probably one of a third generation of the insect. For the most of the state there seem to be but two annual generations as established by Dr. Riley in careful studies conducted by him forty years ago.

Everyone knows the "apple worm" and its work, the "wormy apple." Unlike the curculio, which damages the fruit both as adult beetle and as a larva, the damage from codling moth is done only by the larva. The extent of damage may vary with the stage of the apple's growth when the larva entered, with the variety infested and with various conditions.

By the time the larva has completed its development a large cavity has usually been eaten out about the core, with channels extending through the flesh leading to the surface. Apples wormy

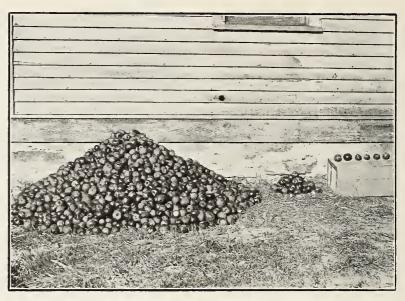


FIGURE 8—PICKED FRUIT FROM PLAT 2, SPRAYED THREE TIMES WITH LEAD ARSENATE

Apples in large pile free from curculio crescents or codling moth worm holes, 97.4 per cent; apples in small pile damaged by curculio, 2.4 per cent; six apples on box to right damaged by codling moth, 1%100 of 1 per cent.

from the side are damaged more noticeably than those wormy only at the calyx end, and since the worms that enter later are more likely to be those boring in from the side, the damage upon the fruit, besides being more abundant later, is also proportionately more in evidence. Although the appearance of apples with calyx worm holes is not so seriously impaired at first, they invariably decay when kept in storage. In fact no apple containing an open worm hole extending into the apple from any position should be packed with first class fruit. Such blemishes permit the entrance of the spores of fungi which are responsible for rot, which as a secondary loss outranks even the original damage from the insect. The larvae, when small, often eat small bits from the apple skin while starting to enter the fruit. These are to be found upon unsprayed fruit, though also abundant upon sprayed apples where the minute worms have presumably been destroyed when they attempt to enter. These small blem-

ishes, sometimes called "specks," upon the apple very closely resemble the healed-over food punctures or "stings" made by the curculio, and as shown by experiment do not perceptibly injure the keeping quality of apples when they do not extend deeper than the skin and when healed or calloused over. These codling moth "specks" on Ben Davis also sometimes grow into the characteristic "horns" mentioned as sometimes following the curculio punctures. Apples with specks from codling moth are damaged slightly in appearance, but a limited number of specks when small are usually permitted in first class fruit. They cannot be entirely prevented, even by spraying. These specks, however, in many cases without the arsenical spray, would have been the much more damaging worm holes.

Some of the so-called "June drop" is also due to the falling of apples damaged by codling moth, though in Missouri the curculio shares as a cause. Due to the two insects in badly infested orchards the majority of the fruit is brought to the ground as green or prematurely ripened windfalls.

The total damage to the fruit crop from codling moth in the United States has been estimated by Dr. Howard, of the Department of Agriculture, at \$12,000,000 each year. The tax of this insect upon apple growers in Missouri in a single year when a full crop is borne runs into the millions of dollars—a drain which with proper treatment could be largely prevented.

One of the main objects of the spraying experiment conducted was to determine the dates of spraying most suitable as a combined treatment against curculio and codling moth. Many entomologists have shown by experiment how it is possible to proceed in con-



FIGURE 7—EGGS OF CODLING MOTH ON FRUIT, NATURAL SIZE Moth resting on fruit on left. (After Slingerland)

trolling the codling moth without reference to the curculio. The remarkably successful results of apple growers in the Rocky Mountain, Pacific and Northwestern States, in controlling codling moth are based upon methods aimed at this insect alone, since the curculio is not destructive if at all present in those sections. Missouri fruit growers must, however, make allowance for an additional and equally important factor—the curculio. There have been, upon the other hand, some very effective plans of sprays advised by entomologists, after experimental trials, to be used on apples with curculio principally in view. Since both insects have always to be dealt with in Missouri orchards it seemed that the problem was worthy of further study in perfecting sprays serving both purposes.

The orchard spraying problem in Missouri, like many of the Mississippi Valley States, is further complicated by the prevalence of several serious fungus diseases, most prominent of these being apple scab and bitter-rot. In the experiments of the writer these were taken into consideration, and in so far as they have bearing upon the sprays for the two insects under discussion they will be briefly referred to later.



FIGURE 6—PUPAE OF CODLING MOTH IN COCOONS (From Quaintance, U. S. Department of Agriculture Year Book, 1907)

Spraying experiments were made in 1908 on a portion of the large commercial orchard belonging to the Olden Fruit Company, situated at Olden, in Howell County. This orchard, containing in all nearly eighteen hundred acres of fruit, lies upon the Frisco Railroad, about one hundred miles east of Springfield. It is in the Ozark region of Southern Missouri.

It was assumed at the outset that a spray of bordeaux mixture applied before bloom for the purpose of preventing scab was necessary, and a good sized block, principally of Gano, Ben Davis and Jonathan, was sprayed. A late frost destroyed the crop on the first block sprayed, and another block of Ingram was set apart. The Ingram is a very late blooming variety, which gave an opportunity of continuing the experiment as originally planned, except that the dormant spray of bordeaux mixture was not given. This did not, however, affect the plan in any way in controlling the curculio or codling moth. The block set aside was a portion about forty rows square, of a ninety-acre orchard of this variety. The oldest trees were about nine years old, but many had been



FIGURE 9—PICKED APPLES FROM PLAT 5 No. 1's, on left, 70 per cent; No. 2's, on right, 30 per cent

replaced by younger ones. A small plat originally forming a part of the block selected was later discontinued so that there were by actual count 1.496 trees in the experimental plat, of which 743 trees were of bearing age. One hundred fifty-three trees of bearing age were reserved without spray for comparison with those

sprayed. The plats receiving the different treatments were from seven to eight rows in width and from 25 to 40 rows long, each containing from 85 to 153 trees bearing fruit. All trees in each plat were given the first spraying whether they bore fruit or not.

The dates and other details of treatment for all plats are shown in Table I, except for one plat which was set aside for testing home-made

and commercial arsenates of lead, which is described later. It will be seen that in all of the principal plats ten pounds Swift's arsenate of lead was used for each 200-gallon tank; where paris green was used it was at a strength of six ounces of poison and four to six pounds of lime for each fifty gallons of water.

The spraying apparatus consisted of a Friend gasoline power outfit. The engine was of the air-cooled type, rated at two and a half horse power, geared directly to a duplex pump with propeller agitator. The pressure usually varied from 150 pounds to 225 pounds. The spraying was done both from an elevated platform and from the ground. The writer, with an assistant, Mr. C. B. Dull, handled the spray poles for all sprayings throughout the season, and aside from a teamster completed the spraying crew. For the first application, when bordeaux mixture had to be prepared, it required another man at the mixing tank.

The principal comparisons planned were the following:

(a) The comparison of early and late sprays, with early sprays only in controlling both curculio and codling moth. From summary it will be seen that Plats 1 and 2 bring out this contrast, as do also Plats 3 and 4, and the results may be seen from Tables IV, V, VI and VII.

(b) Early sprays given at short intervals with special reference to curculio control, as in Plats 1 and 2, compared with early sprays at longer intervals with reference to codling moth control as given in Plats 3 and 4. The results of this comparison may be also seen in Tables IV, V, VI and VII.

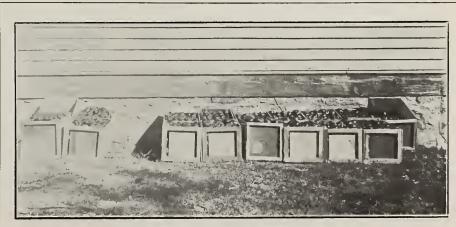


FIGURE 10—PICKED APPLES FROM PLAT 2 No. 1's on right, 80 per cent; No. 2's on left, 20 per cent. Cash value of crop doubled by sprays

(c) Comparison between arsenate of lead and paris green, Plat 4 being sprayed with arsenate of lead upon practically the same dates as Plat 5, where only paris green was used. An exhibit of the results may be seen in Table X.

(d) Comparison of the home-made with the commercial arsenates of lead and a comparison of the efficiency of the different brands of commercial arsenates of lead upon the market.

A more disagreeable and unfavorable spring for spraying is rarely seen in Ozarks than that which prevailed in 1908, when the experiments reported were carried out. Hard, beating rains fell

RAINFALL	DURING	MONTHS	of	SPRING
	SPRAVS	(INCHES)		

	SPRAYS (INCHES)					
Da	У		April	May	June	
1					.22	
2					.44	
3					.04	
4				.29	.64	
5			1.01	2.50	.11	
6				.46	.01	
7				.05	.01	
8			.64		.05	
9			30		.04	
10			1.05		.01	
11			.02	.09		
12				.70	.31	
13				.71	.68	
14			.15	1.20		
15			.16			
17				.09	.32	
18				.15		
22				3.39		
23				.01		
24			1.47		.64	
26			.98			
29			1.12	.60	.20	
	Totals		9.06	10.24	3.72	

RAINFALL AT OLDEN

Sp	ng of 1908 Compared with Previous	rears
Year	April May	June
1908	9.06 10.24	3.72
1907	5,07 7,78	5.72
1906		3.93
1905		3.89
1904		6.61
1903	3.92 8.45	2.10

often, either so as to interrupt the spraying or immediately after spraying had been completed. A heavy rain of more than an inch fell on April 29, temporarily putting a stop to this first and most important treatment. On the same

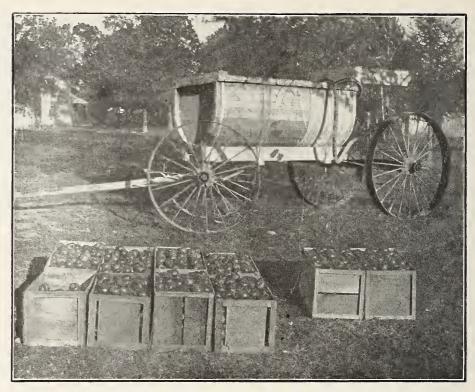


FIGURE 11—PICKED APPLES FROM PLAT 6, WHICH WAS NOT SPRAYED No. 1's on right, 20 per cent; No. 2's on left, 80 per cent

day of the spraying given May 12 nearly an inch of rain fell, and on the two following days an average of about an inch precipitation per day was recorded. During the month of May, when a majority of the early sprays were given, there was a total rainfall of 10.24 inches distributed over thirteen days of the month. On the 5th of May there was a downpour of 2.5 inches, and on the 22nd 3.39 inches fell within twenty-four hours. During the month of June there were fifteen days of rainfall. The rainfall for the month of April in 1908 was 9.06 inches-greater than for any month of April in the five preceding years, for which period the average was but 4.58 inches. The rainfall for the month of May in 1908 was almost twice the average for the five years preceding, which was but 6.02 inches.

These weather records are cited to show the unusually adverse conditions under which the results to be discussed were secured. Many times when the sprayings were given the ground in the orchard, from the almost incessant rains, was so soft that a load of the spray mixture could scarcely be hauled over it. The comparatively light weight of the power outfit used and the broad tires and high wheels of the wagon were at times the only things which prevented delays in sprays at critical seasons.

The records of the rainfall were kindly furnished by Mr. John C. Evans, Jr., manager of the Olden Fruit Company, and at present volunteer observer for the U. S. Weather Bureau.

It is a well known fact that spraying experiments, conducted against insects which fly readily for considerable distances, to represent the true value of the sprays in comparison with the trees not sprayed, must be carried on upon orchard blocks of considerable size. The plats must be of sufficient size that the trees selected from which to measure the effect of the sprays may be so remote from the unsprayed trees that the different plats will not be mutually influenced. This important factor was first taken into consideration in experiments conducted against the codling moth by Dr. Forbes in Illinois in 1887, and its bearing upon experiments against the curculio on apple was worked out by him and reported in detail in 1905.

In laying out the different blocks for spraying in the experiments at Olden this precaution for accuracy was con-

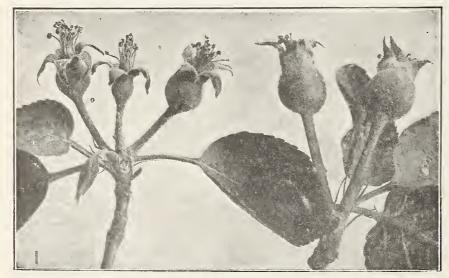


FIGURE 12—YOUNG APPLES, SHOWING ON LEFT CALYX LOBES OPEN AND IN CONDITION FOR FIRST SPRAY; ON RIGHT, CALYX LOBES CLOSED AND ALMOST, NOT QUITE, TOO LATE FOR FIRST SPRAYING (After Quaintance, U. S. Department of Agriculture Year Book, 1907)

sidered, as will be seen by the size of the plats treated. In preparing for the counts of apples to determine the results of the spray, ten trees of uniform size and fullness with fruit were selected as nearly as possible from the center rows of each plat. The plats being seven and eight rows wide, the trees from which all counted apples came were usually at least six rows distant from the counted trees in the adjoining plat, and in no case was there less than four rows intervening. These ten trees centrally located were selected early in the season and a record was kept of the conditions of the windfalls as accurately as possible. Twenty-five different collections of windfalls in all were made, extending from July 6 to when the fruit was picked in October. Windfall collections extended over a total of three months, with average intervals between collections of from three to four days.

The matured apples were picked from the ten average trees in each plat on October 5 to October 9, and each apple was at this time taken in hand and given critical examination for insect injuries. The results of counts are tabulated in convenient form.

Table IV shows the results secured with the use of arsenate of lead against curculio on apple. The calendar dates upon which the sprayings were done are shown in Table I and the relative dates and intervals between the sprayings in Table IV.

In plat 1 the first spraying was given immediately following the dropping of the petals, but before the calyx cups had closed. The second spraying was given ten days following, at about which time the first feeding punctures were being made in the little apples by the curculio, but before the first of the codling moth eggs had been laid. The third application followed in about ten days from the second, being aimed at a time when curculio feeding punctures were being made very abundantly and immediately preceding the appearance of the first of the hatching codling moth worms. The fourth spray in this plat was intended to be principally against the second generation of codling moth larvae, and was being applied when the first of the second generation eggs were found and about six weeks after the third treatment.

In plat 2 the spraying was in every way similar to that given to plat 1,



FIGURE 15—DIMPLES IN APPLES FROM EGG-LAYING OF TARNISHED PLANT BUG
Apples small and fuzzy. Less than one month from hatching of plant bug eggs. About half size.

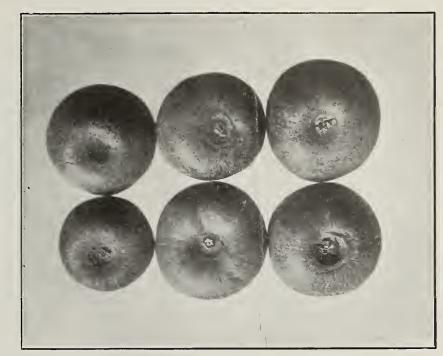


Figure 13—INGRAM APPLES SHOWING PARIS GREEN BURNING AT BLOSSOM END In plat 5, 22.46 per cent of picked apples showed such injury. Practically no such damage from arsenate of lead.

except that the late spray applied in July, when the second generation eggs of codling moth were appearing, was omitted, and only the early sprays being directed with special reference to the curculio were given. As will be seen in the last column of the table, there was no benefit secured by the additional late spray. On the other hand, the three sprays applied as indicated in plat 2 gave 97.6% of the picked apples free from curculio crescents, while plat 6, the unsprayed block, gave only 54.5% free from such injuries.

In plat 3 the first spraying was given, as with the others, after the petals were off and before the calyces were closed. The appearance of the first codling moth eggs of the season was the signal for the application of the second spray, and in this season followed the first spraying about three weeks. In about two weeks codling moth eggs of the first generation were approaching maximum numbers, at which time the third spraying was given. About one month following

the third spraying, eggs of the second generation codling moth were seen appearing, and the fourth spray was applied.

Plat 4 received three sprays in all, the same sprays that were given plat 3, except that the late application in July was entirely omitted. It will be seen that 96.5% of the apples at picking time in plat 3 were free from curculio, while plat 4, sprayed only three times, gave 96.2% of picked apples with no crescent injuries from curculio. The late spraying in this case was also found unprofitable, as the three early, thorough sprayings yielded within one-half of one per cent

of the results secured against curculio with the additional late spray.

As already noted, the spraying in plats 1 and 2 was done more especially with curculio in mind, and that in plats 3 and 4 with special reference to the codling moth. We find that four sprays on plat 1 after the former plan gave 97.5% picked apples free from curculio crescents, and four sprays in plat 3, after the latter plan, gave 96.5% picked apples without curculio crescents, a difference of 1% favoring the former. Again, a comparison of plat 2, receiving three sprays under the plan, also gave a better grade of fruit than three sprays after the second plan, the increase in apples free from curculio crescents being 1.4%. Thus in both sets of comparisons a slight increase in fruit free from damage by curculio was secured in plats with early sprays at short intervals. As stated, in the orchard under experiment, the curculio injuries were naturally more abundant than were those from codling moth.

Table V will show the results that were secured from the different schemes of spraying in preventing codling moth The explanation of the dates injury. of spraying of these four different plats having been given in the description of the preceding table, they may be omitted here. From Table V it will be seen that so far as controlling codling moth is concerned in this orchard, none of the sprays applied late were of any practical value, and virtually the same results were secured with only early sprays. Three sprays, applied as indicated in plats 2 and 4, each gave better than 99% picked apples free from codling moth worm holes, though it may also be seen that in plat 6 the damage to the picked apples from codling moth was only about 15%. No appreciable difference in the results between the applications given early in the season at short intervals, as in plats 1 and 2, and those with early sprays, at longer intervals, as in plats 3 and 4. was to be noticed.

The results of three early sprays properly applied at times indicated in plat 2 is worthy of special reference at this time. Out of 3,419 picked apples, over twelve bushels, from plat 2, only six apples could be found with worm holes from codling moth, or less than one-fifth of one per cent. So perfect was the result of these early sprayings in filling the calyx cups of the apples and preventing apples wormy at the calyx end, that from a total of 29,380 windfall and picked apples from sprayed plats, not one was found wormy at the calyx end from codling moth, while from 2,469 picked apples from unsprayed trees 268 were wormy at the calyx, or over 10%.

Table VI brings together the data for both curculio and codling moth on both windfall and picked fruit, and combines the separate results shown in Tables IV and V. Examination shows that, considering both pests, the additional late spray applied in July gave practically no increase in percentage of perfect fruit, since the three early applications in all plats had been given with almost perfect results. In no instance in the experiment where the early sprays had been applied did the additional late sprays in July pay for their added expense.

In the plats sprayed with early applications at shorter intervals, as given in plats 1 and 2, the results were slightly better than when the early sprays were separated with longer intervals, as in plats 3 and 4, though this would perhaps not have been the case had the codling moth been more abundant than the curculio. Comparing plats 1 and 2, sprayed after the former plan, with the corresponding plats 3 and 4 respectively, which were sprayed after the latter

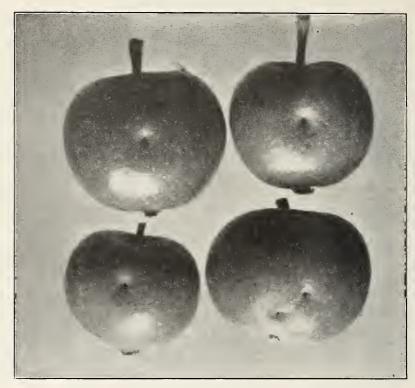


FIGURE 16—DIMPLED APPLES, AS THEY APPEARED ABOUT TWO MONTHS AFTER THE HATCHING OF PLANT BUG EGGS. NATURAL SIZE.

method, the difference in each case is practically only 1%. The difference in this respect may be overlooked when the remarkable benefit secured from spraying in all treated plats as compared with the plat receiving no spray is noted. Including both windfall and picked fruit, 96.2% to 97.9% were free from all codling moth worm holes or crescent punctures from curculio. Including both windfalls and picked fruit, the unsprayed trees yielded only 58.9% free from these insect injuries. The picked fruit from

sprayed plats gave 96.1% to 97.4% free from such injury, while 46.1% of the apples remaining upon untreated trees at picking time were free from serious blemishes caused by one or the other of these insects.

On account of the wormy and stung fruit dropping to the ground before ripening, the yield of picked apples from the unsprayed plat was much less than in the plats treated. From Table VII it is seen that 45.5% of the total number of apples dropped to the ground before picking from the unsprayed trees, while from the trees in the four plats treated with arsenate of lead 24.4% of the total fruit formed dropped. The apparently rather high percentage of windfall from sprayed trees was due to the small trees, in not too vigorous condition, which were too heavily loaded, and to several high winds at times when apples were easily blown off. Notwithstanding this, an average increased yield of about 46% was secured from the four plats sprayed with arsenate of lead. From 63.3% to 65.7% were the actual ratios representing the curculio crescents and codling moth worm holes prevented, due to the spraying.

At picking time the fruit which had been examined and counted for insect blemishes was also given a careful commercial grading. The No. 1 apples were selected from each plat practically according to the standard adopted by the American Apple Growers' Congress a few years ago. No Ingram which passed through a 2¼-inch ring, which was poorly colored, misshapen, or which bore any important mechanical, fungus or insect blemishes was placed in the



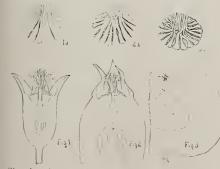
 $F_{\rm IGURE}$ 17—DIMPLES FROM TARNISHED PLANT BUG, AS THEY APPEARED ABOUT TWO MONTHS AFTER EGG HATCHING. ABOUT ONE-THIRD SIZE

No. 1 grade. All others were placed with the No. 2 grade. This grading made it necessary to class many apples from the sprayed plats with the inferior grade simply on account of their being undersized, although the spraying had protected them from insect blemishes or fungus diseases. The No. 1 apples from the unsprayed block were greatly inferior in appearance to the first grade apples from the sprayed block, on account of their dingy, smoky surface, due to the "sooty fungus" which covered them, and which was entirely absent in the sprayed plats. The ratio of No. 1 fruit for the sprayed plats, as will be seen in Table VII, varied from 58.3% to 77.9% of the total yield, while for the unsprayed plat only 20.8% of the picked fruit could be classed as No. 1, and this was damaged in appearance from the "sooty fungus."

The first grade fruit from the experimental blocks was packed in boxes holding a little less than a bushel. Most of this brought the owner on an average about \$1.32 per bushel, while the second grade fruit brought about one-half as much. Using these prices as a basis for computation and the yield and ratio of first and second grade fruit secured from the sprayed and unsprayed plats, it was estimated, as shown in the table, that the value of the crop was doubled by virtue of three sprayings, as given in plat 2, and the increased values secured in other plats treated with arsenate of lead was almost as great.

A careful record was kept of the exact time required for each application in the experiment, as well as the amount of spray liquid used. This was done for the purpose of balancing, after the fruit had been sold, the financial returns realized with the cost of the spraying. The cost of spray materials was computed upon a basis of arsenate of lead at 12 cents per pound, blue vitriol for bordeaux mixture at 61/2 cents per pound, and lime, also used in connection with the bordeaux mixture, at 1/2 cent per pound. In computing cost of applying the sprays, \$5.75 per day was taken as a liberal estimate for labor of team and three men, and for gasoline and oil required to operate the power outfit. This placed the wages of each man at \$1.25 per day. For the sprays, where the third man or driver was dispensed with, \$4.50 per day was taken as a reasonable

(To be continued in next issue)



Showing lower calvx cup with the fleshy stamen bars forming a roof above it, as they appear three days after the blossoms fall. Figure 1a shows the roof as it appears from above. Figures 2 and 2a show the same for an apple ten days later. Note the wrinkled condition of the stamen bars. Figures 3 and 3a show the same for a full grown apple.

By Professor E. D. Ball.

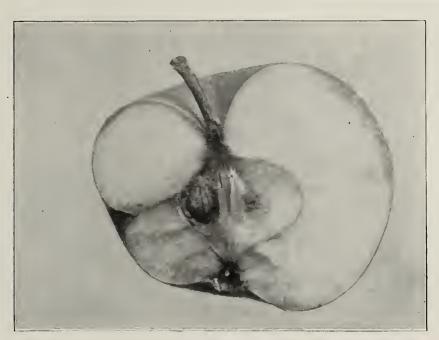


FIGURE 18—CROSS SECTION SHOWING INJURY FROM EGG-LAYING OF TARNISHED PLANT BUG, AS IT APPEARED AT HARVEST. ABOUT NATURAL SIZE

TABLE I—SUMMARY OF SPRAYING DATA IN PRINCIPAL PLATS

Plat	Size	Bearing	First	Second	Third	Fourth	* Spray
No.	of Plat	Trees	Spraying	Spraying	Spraying	Spraying	Material Üsed
1	25x8 rows	128	Apr. 25-May 2	May 12	May 22-23	July 10	Arsenate of lead
2	25x7 rows	85	Apr. 25-May 2	May 12	May 22-23	• •	Arsenate of lead
3	25x7 rows	104	Apr. 25-May 2	May 26-27	June 15	July 10-11	Arsenate of lead
4	25x7 rows	117	Apr. 25-May 2	May 26-27	June 15		Arsenate of lead
5	27x7 rows	103	Apr. 25-May 2	May 27	June 16		Paris green
6	40x7 rows	153	Check: not spra	aved			-

* Formulas used: Arsenate of lead, 2½ pounds to 50 gallons of water: paris green, 6 ounces to 50 gallons of water. Plats 1 to 5, inclusive, received a weak bordeaux mixture in first spray only.

TABLE IV—ARSENATE OF LEAD AGAINST CURCULIO

Dates Sprayed: Plat 1—Four sprayings: (1) Petals off: (2) About ten days later; (3) About ten days after second; (4) About six weeks after third. Plat 2—Three sprayings: (1) Petals off; (2) About ten days later; (3) About ten days after second spraying. Plat 3—Four sprayings: (1) Petals off; (2) About three weeks later; (3) About two weeks after second; (4) About four weeks after third. Plat 4—Three sprayings: (1) Petals off; (2) About three weeks later; (3) About two weeks after second spraying.

Counts of Picked Apples	Plat I	Plat 2	Plat 3	Plat 4	*Plat 6
Total number picked	8969	3419	2189	4737	2469
Number with curculio crescents	230	85	78	180	1125
Per cent free from curculio crescents	97.5	97.6	96.5	96.2	54.5
* Plat 6—Check; not sprayed.					

TABLE V—ARSENATE OF LEAD AGAINST CODLING MOTH

Dates and number of times sprayed, same as given in Table IV.

Counts of Picked Apples	Plat 1	Plat 2	Plat 3	Plat 4	*Plat 6
Total number picked		3419	2189	4737	2469
Number with codling moth worm holes		6	3	13	368
Per cent free from codling moth worm holes	99.55	99.83	99.86	99.87	85.50
* Plat 6—Check: not sprayed.					

TABLE VI—ARSENATE OF LEAD AGAINST CURCULIO AND CODLING MOTH For dates and number of times sprayed, see Tables I and IV

Apples Counted Totals	Plat 1 10736	Plat 2	Plat 3 3094	Plat 4 6442	*Plat 6 4534
Windfalls		1145	905	1705	2065
Picked		3419	2189	4737	2469
Per cent apples free from curculio crescents and co	odling moth	worm h	oles		
Totals		97.6	96.9	96.2	58.9
Windfalls		98.3	98.2	96.7	74.4
Picked	97.4	97.4	96.3	96.1	46.1
* Plat 6—Check; not sprayed.					

TABLE VII—RATIO OF WINDFALLS TO PICKED APPLES; PROPORTION OF GRADES AND VALUE OF FRUIT FROM SPRAYED AND UNSPRAYED PLATS

For dates and number of times sprayed, see Tables I and IV

	-1				
Apples Counted Totals	Plat I	Plat 2 4564	Plat 3 3094	Plat 4 6442	*Plat 6
Windfalls		1145	905	1705	2065
Per cent of windfalls of total	16.5	25.1	29.3	26.5	45.5
Per cent increase from spray in yield of picked fruit Commercial grading of picked fruit	64.0	45.0	36.0	40.0	
Total bushels	25.4	12.2	12.2	16.5	7.2
No. 2 grade, bushels	10.6	2.7	4.2	6.5	5.7
No. 1 grade, bushels		9.5	8.0	10.0	1.5
Per cent of No. 1 grade		77.9	65.6	60.6	20.8
Curculio, codling moth injuries prevented, per cent	65.4	65.7	64.5	63.3	
Values increased, times* Plat 6—Check; not sprayed.	1.8	2.0	1.9	1.8	• • • •

(To be continued in next issue)

ABSORPTION OF ARSENIC BY APPLES FROM SPRAY

BY PROF. P. J. O'GARA, PATHOLOGIST AND ENTOMOLOGIST, MEDFORD, OREGON

URING the past three years the writer has been working on a peculiar spotting of apples, which he now strongly believes to be caused by arsenate of lead. The first cases of this spotting were seen in shipments from Southern Oregon, and, later, upon investigation, it was found that the trouble was more or less general. During the past season almost every district in the United States has experienced more or less of this trouble, so that it cannot be classed as belonging entirely to the arid or semi-arid fruit belts. Some three years ago Mr. M. B. Waite, pathologist of the U.S. Department of Agriculture, called attention to the trouble, and ventured the opinion that it might be caused by soluble arsenic, or perhaps impurities in the lead arsenate. However, Mr. Waite did not make any chemical analyses in order to determine the truth of his hypothesis. About the same time the writer took up the problem, and it has been under investigation during the past three seasons. It is not the purpose of this paper to give all the experimental data, but to merely state a few of the facts that have been observed, and to give, if possible, a reasonable remedy, so as to insure against the trouble in the future. Later the matter will be published in full.

A careful examination of the spotted apples shows that only the epidermal and sub-epidermal cells are injured, so that the injury may be said to be only skin deep. The spotting may be only a peculiar red mottling, with more or less distinct outlines, or it may be entirely black, with distinct margins. It varies, however, with the different varieties, and there are all gradations of injury. This injury may appear before the fruit

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Bosc pear tree which was nearly girdled by blight. When blight was cut out less than one-quarter of an inch of living bark was left. Note the bridge grafts which saved the tree. Two crops of fruit have been grown since the blight was removed. Tree now healthy. Read article in November issue by Professor P. J. O'Gara.

is harvested, depending upon the season, but in most cases it becomes apparent only after the apples have been packed and have remained in storage for a has been indicated above, we have found approximately the same gradations of injury, from the red coloration to the burned appearance, with this exception,



APPLES SHOWING ARSENICAL INJURY

short time. The spot in no way resembles the "Baldwin Spot," which is always to be found affecting the tissues beneath the epidermis, and which may go to a considerable depth in the flesh of the fruit. The Baldwin Spot is a physiological trouble, and is due to the abstraction of water from the cells. In the Baldwin Spot the epidermis usually remains intact, although the cells beneath it may have become disorganized. It has been thought by many that the peculiar spotting in storage was due principally to climatic or cultural conditions, or to late harvesting and over-ripeness. It has also been thought that only the fruits from weak trees, or trees grown without any cultivation, developed this trouble. However, in my experience during the past three years, I have found almost the reverse to be true. In one particular orchard, with the trees in the very best condition, and which grew prize fruit, the greatest amount of injury was found. On the other hand, an orchard of a few trees, which had received no spray treatments for the past two years, and which had received no other attention, did not develop a single spotted fruit excepting those that were purposely sprayed with a soluble arsenical for experimental purposes.

That small quantities of an arsenical in solution will tend to produce a reddish color in fruits is well known. This fact has been shown by experiments with peaches, the results being that the sprayed fruit showed a very high color externally, and, besildes, the flesh was even a deep red as far as the pit. It has also been shown that the maturity of the fruit was hastened by the spray. An amount of soluble arsenic above what would produce this intense color caused burning of the fruit. In the apple, as

that the injury does not extend nearly so far into the sub-epidermal tissues.

The fact that arsenic in the soluble form may be absorbed by apples was easily shown by careful qualitative tests. These tests included not only the characteristic March test, but other tests as well. A very large number of qualitative tests were made of apparently sound, red-spotted and black-spotted apples which were known to have been sprayed with lead arsenate of certain brands. In every case appreciable quantities of arsenic were found. Specimens were



Bosc pear tree showing a bad case of body blight, which has been cut out. Note the bridge graft which connects the healthy tissue above and below the limits of infection. Read article in November issue by Professor P. J. O'Gara.

then sent to the Bureau of Chemistry. United States Department of Agriculture, and careful quantitative tests for arsenic were made. The apples, upon receipt, were carefully washed and wiped off so as to remove all arsenic that might have adhered to the skin of the apples, and thus leave only the arsenic that had penetrated the tissues. Ten-gram samples of the skins of both Newtown and Spitzenbergs varieties and ten-gram samples of the apparently sound skin of the same varieties were examined for arsenic. The samples taken necessarily included not only the epidermal and subepidermal tissues, but a considerable amount of the flesh, which did not necessarily contain any arsenic. This was done in order to be sure that all the arsenic was taken. The result of the analysis showed that the black and red spots contained from 0.03 to 0.05 milligrams, while the apparently sound skins showed 0.025 milligrams of arsenic. No doubt the concentration of arsenic about the injured spots is much greater than analysis show, but, even with the large part of unspotted skin included in the analysis, the badly spotted fruits show approximately twice as much arsenic as the apparently sound fruit.

One analysis of very badly spotted Spitzenberg showed a quantity of arsenic, which, caluculated as arsenic oxid (As₂ O₅), equaled about 0.3 milligrams, or aproximately 0.005 grains. As will be seen, the amount of arsenic is rather small, and there would be no danger of serious poisoning even if such apples were eaten. However, without careful wiping, there is no doubt there might be some slight stomachic disturbances if three or four such apples were eaten at one time. The chances for poisoning are so remote, however, that they are hardly worth considering, since it is known that it requires about 0.005 grams to have a marked effect.



SAN JOSE SCALE AND ITS WORK Peach twig, moderately infested, showing male and female scale. Enlarged four times



DURING SPRAYING TIME IN THE ORCHARD OF W. F. HURST, BOISE, IDAHO

Knowing that the apples will absorb arsenic in a soluble form, the efforts of manufacturers of lead arsenate should be toward producing a compound not only with the least amount of soluble arsenic present, but so made that any soluble sulphides, chlorides or carbonates in the water used to apply it will not cause the arsenic to go into solution. Without going into the matter technically, and which would be beyond the comprehension of the average reader, it may be stated that when disodium arsenate and lead nitrate or lead acetate are combined, under varying conditions, three forms of lead arsenate are known to occur as a result of the combination. These are the ortho arsenate (Pb3 (As O4) 2), pyro arsenate (Pb2 As2 O7) and the meta arsenate ((Pb H As O₄) 2). The first contains the smallest percentage of arsenic oxid (As₂ O₅), but is, nevertheless, the best combination, since it does not readily give up free arsenic in the presence of neutral and alkaline solvents. Strictly ortho arsenate of lead will be nearly pure if it contains 121/2% arsenic oxid (with 50% water). Commercial samples will range somewhere near 12%. or perhaps a little less. Lead arsenate containing above 121/2% to 14% arsenic oxid may be regarded as mixtures of ortho and pyro (or meta), containing from 10% to 50% of the latter comcompounds. Above 14% arsenic oxid the ortho content becomes almost a negligible quantity, at least this is true when the sample shows 15%. Any arsenate of lead which shows more than 16% arsenic oxid may be regarded as unmixed with ortho arsenate. These percentages are to be understood as analysis of leads having 50% water.

It is a common mistake with most growers to select that brand of arsenate of lead which contains the largest percentage of arsenate, no matter what the water content may be. Manufacturers are equally at fault in stating that the arsenic content should be high in order that it may be effective in controlling codling moth. Many brands are sold

purely on the basis of their high arsenic content without any regard to the form in which the arsenic has entered into combination with the lead. Furthermore, it is a well known fact that several brands are acid arsenates, and they could not be otherwise, considering their chemical formula. It must be understood by both the grower and the manufacturer that it is not the excessive percentages of arsenic that are wanted, but rather a timely and proper application of this important insecticide correctly compounded. Personally I would rather use an ortho arsenate containing 12% of arsenic oxid than one having three or four per cent more. I would be just as sure of results in controlling the moth, and at the same time would feel safe that no injury would result.

In closing I may say that I would advocate the use of at least one pound of lime (unslaked) with each pound of lead arsenate. This addition of lime will have a tendency to neutralize any arsenate which would otherwise have a burning effect. The use of combination sprays is certainly not prohibitive. It has been shown that the combination of lead arsenate with lime-sulphur in the control of both codling moth and scab, as well as the combination of iron sulphide and lead arsenate in the control of apple mildew and codling moth have generally resulted favorably. This is particularly true in the latter combination, which has been used to a very great extent in the Pajaro Valley, California, and to a lesser extent in the Rogue River Valley, Oregon. In the Pajaro Valley it has been shown that the addition of iron sulphide to an inferior brand of lead arsenate has really lessened the injury to the fruit and foliage. This is more or less true of any sulphur compound when mixed with the arsenate of lead.

In the preparation of this article I am particularly indebted to the U. S. Bureau of Chemistry and to Mr. W. H. Volck, horticultural commissioner and entomologist for Santa Cruz County, California, for valuable data and assistance.

PREPARATION AND USE of LIME-SULPHUR SOLUTION BY J. P. STEWART, EXPERIMENTAL HORTICULTURE, STATE COLLEGE, PENNSYLVANIA

PRAYING, as applied to horticulture, is just now in a state of transition. This transition involves the breaking away from bordeaux mixture and the whole list of copper sprays which have served for more than a quarter of a century as fungicides and the taking up of what may become an equal list of sulphur sprays. It also involves the abandonment of old formulas and processes for making the latter sprays and the substitution of more definite, economical and less disagreeable methods. Just how complete the transition will be can hardly be predicted now. But this much is certain, that, whereas, two years ago we might easily have told how best to spray a tree, today we must wait for further results before this question can be finally answered.

Among these coming sprays the clear concentrated lime-sulphur solution will undoubtedly occupy a leading place. In commercial form this solution already has a satisfactory insecticidal record of some seven or eight years. In the new home preparation it has an excellent record both as an insecticide and fungicide, being first used by Cordley of the Oregon Station in 1907. Realizing the importance of this work, in the latter part of 1908, the writer undertook to determine the essential features of the preparation of storable lime-sulphur solutions, and, if possible, render their use available to orchardists.

In breif, the results of this study are as follows: In the making of a storable lime-sulphur at home we must first get the formula right. This is accomplished

by using one pound of good lime, one containing 90 to 95 per cent calcium oxid and as little magnesium as possible; two pounds of sulphur and one gallon, or a little more, of water; boiling it all down so as to have about one gallon of total product at the close. This 1-2-1 formula can be made up in any quantity, merely noting that the pounds of lime and the gallons of final product are the same in number, while the pounds of sulphur are just twice as many.

The kind of sulphur may be either flour, flowers, or "powdered commercial" at least 991/2% pure. The last named is probably most desirable, with the flour next, on account of cheapness and the somewhat lessened tendency to form pellets in the process of mixing.

The utensils needed are a cooker, measuring stick, strainer and hydrometer. Their total cost need not exceed \$15. They are described in detail in our Bulletin 92 of July, 1909, so that it will suffice here to say that the cooker may be of either iron or wood, and use either bottom heat or steam. If steam is used it is preferable for accurate work that it be in closed coils, rather than live steam, at least in the latter stages of the process. This is merely because it is desirable that the final volume be under control and be decreasing rather than increasing. Steam jacketed kettles with mechanical agitators are available, and they work very nicely indeed. But where storage is not considered and lower densities are permissible there is no objection to making the material with the use of live steam throughout.

In making fifty gallons of concentrate the procedure is as follows:

Materials-50 pounds best stone lime (not over 10% impurities), 100 pounds sulphur (kind stated above), reduced to 50 to 55 gallons of total product at finish.

Put ten gallons of water in kettle and start fire. Place lime in kettle. After slaking is well started add the dry sulphur and mix thoroughly, adding enough water to maintain a thin paste, which requires about five gallons. After the slaking and mixing are completed add water to the height of 50 gallons on the measuring stick and bring to a boil, and stir until the sulphury scum practically disappears. Then add water (preferably, but not necessarily, hot) to the 60-gallon height and boil again to 50 gallons if storage space is limited. If it is not limited a little more water may be added the third time and boiling stopped at about 55 gallons. The material should be kept well stirred, especially during the early stages of the process, and any lumps of sulphur or lime should be thoroughly broken up.

The time of boiling should be until the sulphur granules are evidently dissolved. This fact is best determined by dipping and slowly pouring some of the material, under close observation. In many cases we have obtained as complete dissolving of the sulphur in less than forty minutes of actual boiling as was obtained by any time up to two and a half hours. In general, a period of forty to sixty minutes of actual boiling should be safe and sufficient to put the sulphur into solution. But the amount of sulphites and sul-



SPRAYING IN A BEARING ORCHARD IN THE FAMOUS YAKIMA VALLEY, WASHINGTON



SPRAYING SCENE IN THE HOOD RIVER VALLEY, OREGON

phates, and, therefore, the sediment, are undoubtedly increased by unduly prolonged boiling. Hence the amount of water added in the third addition should be so regulated as to permit the necessary boiling, and just reach the desired volume at the close. This gives the least sediment, and the regulation can be easily accomplished after a few trials.

The finished product may be immediately poured or strained into a barrel or settling tank. The straining is merely a safeguard to prevent possible clogging due to imperfect materials or failure to break lumps in the sulphur. When properly made the amount of sediment left in the strainer is insignificant. To avoid any considerable loss of materials it may be washed with part of the water used in making the next lot, simply pouring the water through the strainer into the kettle, and any lumps of sulphur discovered may be broken up and used again.

The sediment is apparently of no value as a spray material against insects, hence its volume and removal, especially in the commercial preparations, become matters of importance. It is composed very largely sulphites and sulphates of calcium, together with the magnesium, iron.

aluminum and other insoluble impurities in the lime and sulphur used. Its volume is affected chiefly by the ratio of lime-sulphur, the purity of materials and the time of boiling. Its relative volume also naturally increases with the density of the product. Made as described above its actual volume apparently runs from 5% to 9% of the total product.

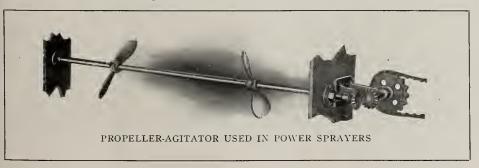
In the home preparation the difficulty of its economic removal and its fineness and apparent lack of objectionable mechanical qualities, except in displacing valuable materials, have led us to disregard it. If desired, however, it may be removed by letting the product settle for about a day, drawing off the clear portion and straining the remainder through a moderately fine cloth inside of the strainer. The sludge may then be washed free of any further valuable materials in the manner stated above.

If properly handled lime-sulphur preparations apparently can be preserved indefinitely. Ordinary changes in temperature have little effect on them. But they are very sensitive to a number of other influences. Continued exposure to air, for example, results in the development of a crust of solids of varying

thickness. This is prevented by cutting off the exposure to air, either by an oil covering or by immediate storage in tight closed vessels, filling them completely. When the crust does develop it can be skimmed off with a fine screen and readily redissolved by heating either in water or in the concentrate itself.

These solutions are also decomposed by a number of other things. Acids, carbon dioxid, certain arsenicals, and even extra lime put in as a marker, all appear more or less rapidly to break down the lime-sulphur combination. This is by no means always fatal in practical results, but we believe it is to be avoided when possible. Most of them can be avoided by elimination.

In the case of arsenicals, however. their addition is necessary if the material is to be used as a summer fungicide. The addition of arsenate of lead results in very rapid decomposition, both of itself and the lime-sulphur. The resulting compounds seem to give good results practically, however, so that we cannot entirely condemn the process just at present. But it seems to be a very wasteful process, especially when we can obtain the same poisoning power in another arsenical-the arsenite of limefor about one-sixth the cost. The latter arsenical also is practically stable in the lime-sulphur solution. It has been in use to a greater or less extent for a long time in connection with other fungicides, but has been limited by a tendency to burn foliage. This is practically avoided by making it up with a slight modification of the Kedzie formula, the method being described in the above mentioned bulletin of the Pennsylvania Station. The use of paris green in this solution,



we believe to be undesirable, with nothing to commend it.

In the application of any concentrate, either home-made or commercial, it is essential that a definite method of dilution be followed. Two solutions may look exactly alike and yet differ widely in density, so that any accurate method must be based primarily on the density of the concentrate that is being diluted. Moreover, we believe that recommendations based on the density of diluted spray are preferable to those based on the number of dilutions, even when accompanied by a statement of the concentrate's density.

Accurate dilution is very simple and easily accomplished with the aid of a hydrometer having the specific gravity scale. Sprays of any desired density may be obtained from any concentrate by simply getting the reading of the concentrate and dividing the decimal of this reading by the decimal of the spray desired. For example, if the reading of the concentrate is 1.27 (about 31' Beaume), to get a spray of 1.03 density we divide the .27 by .03 and obtain nine, which is the number of dilutions required, and which, of course, is obtained by adding eight volumes of water. In this we are simply applying the general fact that the densities of solutions heavier than water vary inversely with the number of dilutions.

This method gives final sprays of definite density, and the importance of this is obvious when we consider the relatively small margins between 'safe and unsafe densities in the use of these solutions on foliage.

With Beaume hydrometers the dilutions are obtained indirectly either by conversion into the specific gravity scale or by means of a special dilution table. In the latter case, however, a table is likely to be needed for each density of spray desired.



THE PEACH BORER AND ITS WORK.
The "borer" and its cocoon at root crown of two-year-old peach tree

The following table gives the uses of the lime-sulphur spray as far as our present knowledge extends: While it is believed that the densities recommended in this table will generally prove efficient and safe where pure solu-

Insect or Disease	Spraying Times	Density
San Jose scale	Trees dormant, but best in fall or spring	1.03 for regular annual control; 1.04 in bad cases, especially on old
Oyster shell scale	At hatching time	apple trees 1.02
Blister mite	Just before buds open	1.03 to 1.04; the latter strength for aphis eggs (Col. Bull. 133:27)
Apple and pear scab	(1) Blossoms beginning to show pink (2) Within a week after petals fall (3) About three weeks later	1.01; may be varied by .002 or more either way, as results direct
Cherry leaf spot	Three sprayings, a month apart, beginning with signs of infection	1.01, or slightly weaker
Peach scab and brown rot of stone fruits (experimental as yet)	(1) Three or four weeks after petals fall (2) Half way between (1) and (3) (3) Two weeks before fruit ripens	1.003 to 1.005; may be varied .001 either way, as results direct. On peaches and plums, limited trials only, testing effect on foliage by applying to a few trees several days before regular applications



PROFESSOR W. M. SCOTT, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C., SPRAYING IN HIS PEACH ORCHARD AT SLEEPY CREEK, WEST VIRGINIA

The "Friend" power sprayer being used

tions are used, yet occasional injury has occurred from third and fourth applications when the earlier applications of the same strength of spray had proved entirely safe. The presence of salt in some of the commercial preparations makes caution desirable in using them upon foliage. Also, the abundance of the application may frequently affect the amount of foliage injury nearly as much as the density of spray applied.

As compared with our other leading sprays, the advantages of the storable, home-made lime-sulphur are conspicuous. In total cost, including the making, it will produce a 1.03 scale spray for about three-fourths of a cent, or less, per gallon, while the commercial preparations usually cost two cents or more. The known absence of superfluous, and possibly harmful, ingredients is also of some importance. For apple scab it does not "russet" the fruit; it can be made up beforehand, and in proper strengths costs about one-quarter of a cent per gallon. Bordeaux (4-4-50), on the other hand, russets fruit, is not storable and costs about one-half cent per gallon.

FUNGOUS DISEASES OF FRUITS-THEIR REMEDIES

BY W. S. BALLARD, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

HE successful horticulturist unconsciously acquires, by his daily association, a mental picture of what he considers a typical form of the particular kind of trees, bushes or vines he is growing. He becomes so expert in his judgment that he quickly recognizes any abnormal appearance, and immediately begins to search for the possible cause.

He is particularly interested in producing fruit that is as good, or a little better, than the best in his section, or any section that he can learn of, and he is not satisfied until he has acquired that goal, or has come as near it as possible. The disease problem is one of the chief factors that claims his attention in this endeavor to produce the best grade of fruit. With our present facilities for transcontinental shipment and the frequent introduction of fruit or plants from various parts of the world, there is an ever present possibility of introducing new pests to add to those already present, and the successful enforcement of quarantine laws is our chief protection against these foreign introductions. We may feel thankful that it occasionally happens that a new pest does not thrive in its new environment, but it frequently happens that the new environment is more congenial than the old.

When the pest problem asserts itself as a controlling factor in the agriculture of any locality the ability to grow crops then becomes largely a matter of the success of the methods of overcoming such pests, and the willingness of the growers to adopt the proper practice and carry it out thoroughly and strictly in accordance with the proper recommendations.

One of the chief methods of fruit pest control is spraying; and the investigator of these troubles in continually endeavoring to impress upon the grower the three very important factors in successful spraying: First, the proper material must be used in the proper strength; second, the work must be done at the proper time, and, third, it must be done thoroughly and in the proper manner.

It is correctly said that the pest problem in the United States is largely instrufungus. The so-called California peach blight is caused by another fungus, and still another one produces peach leaf curl. Root rot is commonly caused by one of the toadstool fungi, and pear blight by one of that large group of



DEFORMED APPLES DUE TO CURCULIO PUNCTURES. REDUCED ABOUT ONE-HALF

mental in making apple growing a profitable business, for the grower who is not willing to fight soon ceases to be a commercial grower, and if there were no difficulties connected with the business the profits would be proportionately small.

Of the various types of fruit diseases, we are concerned in this discussion with those caused by fungi. The fungi constitute a large group in the plant kingdom. They are plants just as surely as are the grape vine or the peach tree upon which some of them grow parasitically and produce disease.

Apple scab is caused by a fungus growing in the outer layers of the skin of the fruit, and also in the leaves. Pear scab is of a similar nature, but is caused by a different, though very similar,

organisms called bacteria. The fungus group is, therefore, a very large one, including, indeed, probably as many different species as all the rest of the plant world together; and when we speak of the fungus diseases of plants we refer to the diseases caused by the members of this group.

It is often supposed that rain in itself is the cause of these plant diseases, or that rain causes fungi. The progressive fruit grower is rapidly coming to realize that these are mistaken ideas. The diseases are usually produced by fungi; but the damp weather merely makes it possible for the fungus to grow, just as moisture is required to start garden seed, for the fungus plant grows from little bodies called spores, which correspond in function to the seeds of higher plants, and the rain enables these spores to germinate and give rise to the fungus plant, just as it enables corn to sprout and eventually give rise to the corn plant. The spores are microscopic in size and are easily blown about by the wind, so in an orchard or a locality where, for instance, peach blight has been prevalent we may be sure that the spores of the peach blight fungus are well distributed through the trees; and when the proper conditions of moisture and temperature arise an outbreak of the disease will occur unless spray material is already present to kill the young fungus plant as soon as the spore germinates and before it gains entrance to the peach twigs. For, once is has worked its way into the inner tissues of the bark it is protected, and no spray applied to the outside can have any effect in killing it. Thus it comes that we must spray for peach blight in the fall, before the rains set in.

The first attempts at spraying were made by the growers themselves. Such men no doubt had very little information or conception of the real nature or cause of the particular diseases they were



SPRAYING IN HUNTER'S HILL ORCHARD, WHITE SALMON VALLEY, WASHINGTON

trying to control, and they were, therefore, compelled to exercise their ingenuity in an attempt to find a remedy; and, indeed, some of the supposed remedies employed during the sixteen and seventeen hundreds were very ingenious.

Among the great array of common substances early experimented with it would be strange if some valuable remedy had not been found; and thus, in 1821, sulphur was recommended in England for peach mildew, and sulphur is today probably our best fungicide for that class of diseases called mildews. As early as 1833 we find what is essentially a weak lime-sulphur solution recommended in this country for mildews. Up to 1880, however, no very satisfactory remedies were in use for the fungous diseases, with the exception, perhaps, of sulphur in various forms, as mentioned for midews. About 1880 a more or less systematic search for substances having fungicidal properties was taken up by French investigators, and the matter was soon sifted down to the employment of copper compounds; and of various classes of substances so far tested copper compounds still remain as the most generally potent fungicides. In 1882 the value of bordeaux mixture, made by combining lime and blue stone or copper sulphate, was discovered by accident in France, and it proved to be such a generally valuable remedy and stimulated such an array of investigations of plant diseases that we may say the serious study of the subject of plant disease control began about that time-twenty-five or thirty years ago.

Within a few years after the discovery of bordeaux the treatment of plant diseases began to receive attention in this country. Black rot of the grape, that was causing trouble in France, was likewise damaging the crops in the Eastern states, and in 1885 the Federal Department of Agriculture published its first two circulars on fungous diseases. They dealt with the treatment of downy mildew and black rot of grapes. Up to 1890 less than a dozen different plant diseases had received the attention of the Federal



SPRAYING IN ONE OF THE MANY BEAUTIFUL ORCHARDS IN WENATCHEE VALLEY, WASHINGTON

Department of Agriculture. The work had hardly commenced. Within recent years, however, the combined efforts of the various state experiment stations and of the federal department has produced a remarkable array of work, and we may feel assured that no European country has made anything like the showing we have in the practical control of horticultural pests.

To illustrate, the Ohio Experiment Station has recently issued a bulletin called "A Brief Hand Book of the Diseases of Cultivated Plants in Ohio." In it are briefly discussed over four hundred different diseases, practically all of which occur in that state, and nearly all are of fungus origin. The apple claims twenty-four of these, the peach eighteen and the pear ten.

Some of these Eastern troubles will no doubt reach the Pacific Coast in time, but many of them that are of serious consequence there will not cause by any means the same amount of damage in California. Brown rot, for instance, is capable of destroying seventy-five per cent of the peach crop in Georgia in less than a week if a series of damp, warm days come at about the picking time. Brown rot exists in California, but it will never become a serious pest of stone fruits because the dry summer weather will not allow it to develop. On the other hand, the apple powdery mildew seems to find the environment of the arid West more conducive to its development than are the conditions east of the Rocky Mountains. Other examples might be cited of the relative severity of a given disease in different localities.

Considering some of the fruit diseases of this state, let us review briefly our knowledge of the commoner ones, and their methods of control.

One disease that is common to a large number of fruits is root rot. Peaches, apricots, almonds and apples are frequently destroyed by this malady. Some blocks of apples in this valley have been very seriously attacked. When a tree is once affected it is almost sure to go sooner or later. As mentioned before, the usual type of root rot found in California is caused by a form commonly called the oak tree fungus, or toadstool fungus, and many orchardists recall oak trees standing in the locality where trees have since died out in their orchards. The fungus is one of the toadstool group, and in damp springs large patches of toadstools are frequently seen coming up around the base of a tree that is being rapidly killed. The disease may be quite easily recognized on examining the crown and roots of the tree, for if the root rot is present it can be detected by the white fibrous layer of fungus threads, or mycelium, as it is called, occupying the region of the cambium layer, just between the bark and the wood. Sometimes the outer surface of the roots is flecked here and there with bits of the white mycelium. The inner bark dies



SPRAY MIXING PLANT OF B. F. HURST, BOISE, IDAHO

and turns brown, and the toadstool odor is usually very distinct in this dead bark. The parasite probably gains an entrance by some of the smaller roots or through bruises of the larger ones, and gradually progesses until it has involved the whole root system. The fungus appears to be capable of living in the soil for quite a period of years after the tree has died, and for this reason it is very uncertain business to replant in spaces where trees have died out, at least for several years. Replanted trees sometimes grow for five or six years and then succumb. It is common to see apples, peaches and almonds infected and killed within a year from the time of resetting. It happens that the pear root is resistant to this root rot fungus, hence pears may be used for replanting if desired. When root rot destroys one or two trees in an orchard it is usually noticed that within a few years others near by commence to die out, and the area gradually enlarges. This spreading is brought about by the fungus slowly growing through the soil and continually encroaching on new territory. Undoubtedly, too, the cultivating tools help to carry the decaying roots from the diseased to the healthy parts of the orchard. When a tree is seen to be dying from this cause it should be immediately removed and the roots dug out as much as possible and carried away from the orchard. The practice of removing the tree as soon as it is seen to be infected will help in checking the rapidity of advance upon the healthy trees. It is perhaps a good plan to allow the holes where trees have been removed to stand open, so as to dry out, for this may kill some of the disease material. Putting lime in the holes is of questionable value

Regarding the peach, there are two common diseases in California, both of which are very easily controlled by spraying. Peach leaf curl has been known for many years in this state. Some varieties, as the Lovell, are par-



SHOWING ONE OF THE MANY USES TO WHICH THE ENGINE ON THE POWER SPRAYER MAY BE PUT

ticularly subject to it. The thorough spraying and the dry springs that have occurred for the past three years have done much to reduce the trouble. The remedy is spraying with bordeaux or lime-sulphur solution in the spring as the buds swell.

The other common peach disease is the California peach blight. As previously pointed, its control requires, in in the first place, a thorough fall spraying before the hard rains set in, and this can just as well be put on as soon as the foliage is off the trees. Spraying and weather conditions have greatly reduced peach blight within the past few years, but when the trouble was at its height it was demonstrated that bordeaux gave somewhat better results than lime-sulphur solution in its control. At the present time the disease

has been so thoroughly reduced that lime-sulphur will no doubt prove thoroughly efficient for fall work this season if the grower wishes to use that spray.

To make a thorough clean up, a second spraying should be applied in the spring as the buds swell. This is also the time for the peach curl and the peach moth spraying. The University Experiment Station has demonstrated the thorough efficiency of lime-sulphur in controlling peach moth when applied at the time the buds are swelling. All things considered, an effective and very valuable plan to follow would, therefore, be to spray in the fall with bordeaux, and in the spring with limesulphur, for the latter has sufficient fungicidal properties to do all that appears to be required of it at that time of the year, and is at the same time an efficient insecticide.

The commonest disease of apricots is what is usually called shothole, or scab. On the fruit it produces the red spots which sometimes seriously depreciate the value of the crop. On the foliage similar red spots develop, and the affected area eventually drops out, leaving a hole, hence the name shothole.

After peach blight came to be properly recognized and understood many growers began to look upon apricot shothole as caused by the same fungus. On the surface that seems improbable, since apricot shothole was known in some districts long before the peach blight made its appearance, and in some sections of the state where peach blight is practically unknown apricot shothole is very prevalent. From a considerable amount of experimental spraying and laboratory work I am inclined to the opinion that the peach blight schedule of spraying is not going to prove successful in the control of apricot shothole. It, appears however, that some good may possibly be done. The problem requires further investigation.



FILLING THE TANK WITH FILLER PUMP

BETTER FRUIT

PEAR TREE SLUG

a, Adult fly; b, Larva or slug, with slimy covering removed; c, Same, in natural condition; d, Leaves showing slugs and their injuries.

Pears are subject to two serious diseases in this state, the most important being pear blight, which also attacks apples, quinces, loquats and other wild forms of the pome family, as the California holly. The method of treatment has been so widely discussed within the past years that every grower is more or less familiar with it. It should be understood that the various patent remedies for pear blight are fakes. The origination of these patent remedies has kept pace with the invasion of pear blight as it has gradually swept across the United States from East to West, and each new pear blight territory has its promoters of supposed remedies to be put in holes bored in the trunks of trees or poured around the roots. The only solution of the difficulty for the susceptible varieties is to follow the recommendations already given, for the hundred years and more that pear blight has been known in New York state has

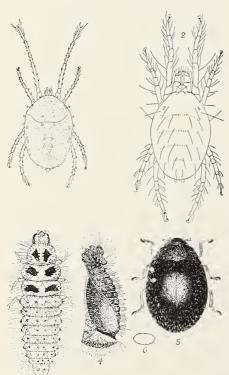


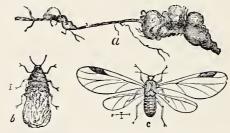
Figure 1, Brown mite; 2, Red spider; 3, 4, 5 and 6, Larvæ, pupa, adult and egg of Scymnus punctum. Figure 1 enlarged 66 times; 2, 133 times; 3, 4, 5 and 6, 30 times. Original. Miss M. A. Palmer, delineator. Colorado Experiment Station.

given time for a careful investigation of all possible remedies.

Pear scab, in most sections, is controlled by two sprayings with bordeaux at the time the cluster buds are opening, and another after the fruit sets, as recommended in one of the state experiment station bulletins. There are localities and seasons in which later sprayings will no doubt be required.

The cherry has its troubles in the way of sunburn and die-back. Sunburn sometimes does considerable damage on young trees, and can undoubtedly be prevented to a large extent by thorough whitewashing of the trunks and lower parts of the framework limbs. Many opinions could be offered concerning the die-back, but definite information is still lacking.

Finally, we may consider the apple. Pear blight affects it seriously in some sections, and the treatment is along the same line as that applied to pears. Apple scab is not as common in California as one might expect from the climatic conditions of some of the apple sections, and



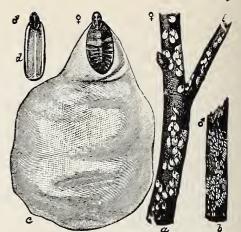
WOOLLY APHIS, ROOT FORM a, Small root showing swellings caused by the lice; b, Wingless louse, showing woolly secretion; c, Winged louse. (After Saunders.)

its control is relatively easy. Spraying with bordeaux or lime-sulphur at the time the leaf buds are opening, and, possibly, one or two later applications of bordeaux, depending on the weather conditions, will control this trouble. In this locality, as well as other coast sections, bordeaux should be used with caution, for the fogs and humidity are apt to cause bordeaux injury to the fruit as well as the foliage.

The malady known in this section as "sappy bark disease" is still an unsettled problem, both as to its cause and means of control.

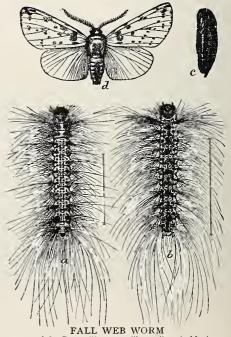
At present the most serious pest with which the apple growers of Pajaro Valley have to contend is the apple powdery mildew. It is relatively quite common throughout the state—in fact throughout the arid West—but does most damage along the coast.

It usually occurs on the lower side of the leaf and has a white powdery appearance, as the name would indicate. Even a small infection is sufficient to stunt the growth and cause a crinkling of that particular portion of the leaf, and when several infections become established at once on a young growing leaf the result is an almost immediate checking of growth and the stunted leaf becomes very much crinkled. The current year's twigs are also very susceptible to infection, becoming entirely covered with the white powdery growth. As a terminal bud is expanding the emerging leaves may become infected on

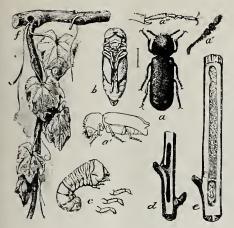


SCURVY BARK LOUSE a, Twig showing scales of female louse; b, Twig showing scales of male louse; c. Scale of female, greatly enlarged; d, Scale of male, greatly enlarged.

both the upper and lower surfaces as rapidly as they appear, and in the end the bud itself may be killed, leaving only a rosette of tiny leaves, which soon dry up. In that case the terminal growth of the tree is practically nil. The white powdery substance characterizing the mildew consists of myriads of spores, which are easily blown about the orchard, and during the foggy nights they germinate and start new infections. The lower surface of the leaf is more susceptible to infection than the upper. hence it is usually on the lower side that the mildew occurs. Obviously with this stunted foliage the tree is not capable of producing nourishment for all the growth to which it is entitled; and no doubt, too, the effect is frequently felt on the setting of next year's fruit buds. It appears that the mildew has a toxic or poisonous effect upon the tree, which seems to make it more susceptible to further infection as well as stunting the growth. The white powdery spores appearing during the summer are relatively shortlived. The natural provision which the fungus has for bridging over from one season to another is by means of more resistant resting spores than are pro-



a and b, Caterpillars; c, Chrysalis; d, Moth.

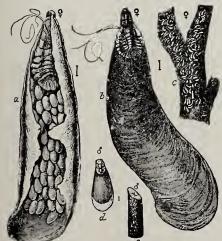


APPLE TWIG BORER

a, Beetle, dorsal view: a, Side view: b, Pupa, from beneath: c, Grub, side view: d, Apple twig showing burrow; e, Burrow in tamerisk with pupa at bottom; f. Stem of grape, showing burrow. All enlarged except stems showing burrows.

duced from the middle of summer on. These spores are capable of withstanding freezing and drying, but they are evidently of very little importance in starting the following year's infections in this locality, for the fungus very frequently infests a twig so thoroughly that it gets into the buds, and in the dormant buds it winters over in the mycelial form, and is there ready to expand and keep pace with the growth of the new leaves as they develop the following spring. This wintering-over of the fungus in the buds is a rare and peculiar habit for the members of the mildew group of fungi. It is made possible no doubt by the mild winters, and is responsible for starting practically all the infections in the spring.

The disease appears to have existed here for the past fifteen or twenty years, and for a number of years now has been attracting the attention of the growers. It early developed that the methods ordinarily recommended for apple mildew control are ineffectual in this section. About four years ago Mr. C. H. Rodgers took steps to interest the United States Department of Agriculture in investigating the problem. It was impossible to take the work up until a year ago last spring, and in the meantime Mr. Volck was at work, and obtained some very valuable results. During the pres-



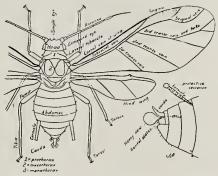
OYSTER SHELL BARK LOUSE

a, Female scale, from below, showing eggs, greatly enlarged; b, Same, from above; c, Female scale on twig, natural size; d, Male scale, enlarged.

cnt season Mr. Volck and the federal department have been co-operating, and a considerable amount of data has been gathered, which is to be published this year as a bulletin of the United States Department of Agriculture.

The various fungicides commonly in use for controlling plant diseases may be placed under two headings—the copper sprays and the sulphur sprays. The copper sprays include bordeaux as ordinarily prepared, and, in addition, various modified bordeaux, copper acetate, copper chloride, copper carbonate, etc.; and the sulphur sprays have until recently consisted of either ordinary ground sulphur or one of the soluble sulphides, as potassium sulphide or sodium sulphide, or the common lime-sulphur solution.

In the investigation of the mildew problem practically all the spray materials known have been tried, and a large number of other substances that sug-



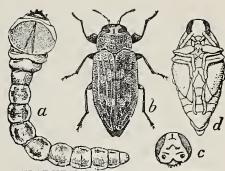
EXTERNAL STRUCTURE OF AN APHIS Colorado Experiment Station

gested themselves as having some possible value have been prepared and fairly tested.

Just at this point it is great pleasure to mention the very kindly interest that Mr. Rodgers has continually taken in this work and the valuable assistance he has rendered by giving us unreserved access to his entire orchard, for when experimental spraying is to be carried on there is always a danger of causing serious injury to the trees as well as spoiling the crop, and in the present instance we have accidentally overstepped that danger line more than once.

Regarding the value of copper sprays, bordeaux is almost useless for apple mildew control in this section, and only one or two of the other copper compounds tried have offered any hope at all.

As has been mentioned before, sulphur is the commonest remedy for the mildew group of plant diseases, and at present it is the best remedy we have to offer for the apple powdery mildew. In fact so far as the mildew is concerned it can be entirely satisfactorily controlled by certain sulphur sprays, but other difficulties enter which tend to counteract the good qualities of these sprays. To digress a bit, the longer one is engaged in experimental spraying in this section the more he becomes convinced of the sensitiveness of the trees and the ease with which injury may be brought about. This sensitiveness is undoubtedly the result of the climatic conditions. fighting fungous discases by spraying the spray material must have sufficient poisonous properties to render it capable of



FLAT-HEADED APPLE TREE BORER a, Flat-headed larvæ; b, Mature beetle; c, Head of mature beetle; d, Pupa. All twice natural size.

killing the fungus, but must not be sufficiently toxic to injure the crop plant. The fungicide must, therefore, be so selected as to fit into the interval between the killing point for the fungus and the point where injury begins to appear on the host plant. For this valley that interval, or leaway, is very narrow, hence the difficulties that have arisen in the present problem. For instance, certain strengths of commercial lime-sulphur solution and of other soluble sulphide solutions that are now quite commonly used in other parts of the United States, with little or no danger of injury to the apple foliage, are entirely out of the question here. Fog no doubt plays a large part in explaining the injury to apple foliage that may result in this valley from the use of spray materials that appear to be harmless in other parts of the United States. The explanation is evidently as follows: Water, and especially atmospheric moisture, is capable of dissolving small quantities of most any substance that may be applied as a spray; indeed this solvent action is necessary to accomplish the

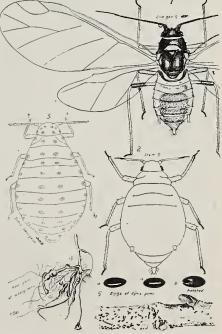
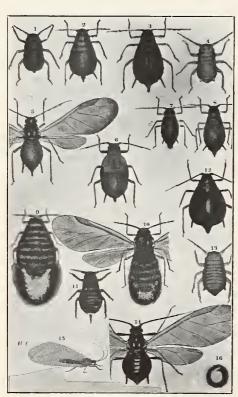


FIGURE 1, Winged viviparous female of aphis bakeri; 2, Stem mother of aphis bakeri; 3, Wingless viviparous female of Schizoneura lanigera, showing wax glands; 4, Root galls of woolly aphis of the apple; 5, Eggs of the green apple aphis (aphis pomi): a, Eggs much enlarged; b, Eggshell after the louse has hatched; c, Apple twig with eggs upon it. Figures 1, 2 and 3 are enlarged 30 diameters; Figures 5 a and b enlarged 20 diameters; c, enlarged 2 diameters. Colorado Experiment Station.

beneficial results of such a fungicide as bordeaux. Foggy conditions, however, produced decidely different results from The deleterious substances dissolved in rain water are largely washed off the foliage by the rain itself, whereas dew usually merely wets the foliage and then dries up. There is very little of the washing process. Thus each time dew collects upon the foliage a small amount of spray material is apt to dissolve, if it is at all soluble in atmospheric moisture, and with the alternate wetting and drying of the foliage, and no actual washing off, extremely minute quantities of a toxic substance may eventually accumulate in sufficient amounts in the leaf to cause injury. This is no doubt the explanation of the extreme sensitiveness of apple foliage in this section to spray materials in general, and is probably the explanation of certain difficulties that have been met with in the apple mildew investigation.

The solution of the mildew problem in Pajaro Valley may be of more than local value, for new and non-injurious fungicides are much needed east of the Rocky Mountains, and it is hoped that the exacting conditions of this section will lead to the development of something usueful in those localities where similar, but not so severe, climatic conditions prevail at times.

Since the soluble sulphides are out of the question, if sulphur is to be used at all it must be in an insoluble form, and at present the matter is sifted down to the use of sulphur itself. But while



PLANT LICE

Green Apple Aphis: 1, Young stem mother; 2, Adult stem mother; 3, Adult apterous viviparous female, second generation; 4, Young female, second generation; 5, Winged viviparous female of third generation; 6, Pupa of preceding; 7 and 8, Apterous male and female. Woolly Apple Aphis: 9, Apterous viviparous female; 10, Fall migrant; 11, Overwinter young. Black Peach Aphis: 12, Adult apterous viviparous female; 13, Young female, first instar; 14, Alate female; 15, Chrysopa sp. and eggs; 16, Cocoon of preceding.



ENTRY NO. 4—THE CUSHMAN POWER SPRAYER, WHICH WON THE GOLD MEDAL IN THE POWER SPRAYER CLASS, AT HORTICULTURAL CONGRESS, COUNCIL BLUFFS, 1910

ground sulphur is effective against the mildews of other plants and in other localities, the finest grades obtainable are of practically no use here. In the work previously done by Mr. Volck it was found that when lime-sulphur solution is added to a solution of copperas, or iron sulphate, a flocculent, black, muddy mass precipitates, which is effective in controlling mildew. This discovery has been followed out by an extensive series of experiments during the past two seasons, and it appears that the virtue of that material lies principally in the large amount of precipitated sulphur which it contains in addition to the black iron sulphide. This sulphur is of the same nature as the finely ground article used for grape mildew, but is far finer than anything that can be produced by grinding. In addition, a number of other sprays have been prepared containing sulphur in an extremely finely divided form, and all have possessed the virtue of mildew control, and also have the very desirable property of stimulating the growth of the tree.

To somewhat counteract these good qualities we have two bad features that accompany sulphur sprays. First (and again probably due largely to the sensitiveness of the trees in this valley), if the spray is too heavily applied it is apt to cause a dropping of the fruit and, to some extent, the foliage. Second, the fruit having a deposit of spray material on its exposed side is more susceptible to sunburning when a period of hot days comes. The foliage dropping that accompanies the use of these sprays is of no serious consequence, since the growth stimulated more than makes up for the loss, and it is hoped that a method of entirely eliminating the damage to the fruit will be eventually worked out. During the past season a considerable amount of commercial spraying with this so-called iron sulphide spray was done in this valley, and the results are encouraging. The method of preparing the spray and the times for application will be discussed in the bulletin to be issued

The problem is not yet finished, but it is hoped in the end to have a satisfactory method for the control of mildew worked out.

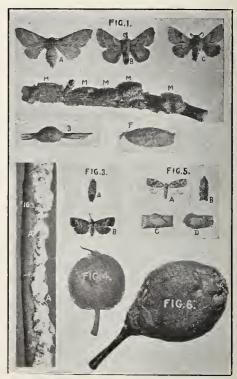


FIGURE 1—Western Tent Caterpillar: a, Female moth; b, c, Males; mm, Apple twig with egg masses; f, Cocoon; 3. Egg masses of American tent caterpillar, life size. FIGURE 2—Cottony Maple Scale: a, Scales mostly hidden by secretion, life size. FIGURE 3—Codling Moth: a. Wings closed; b, Open; enlarged about one-fourth. FIGURE 4—Apple showing white egg of codling moth (under letter f), life size. FIGURE 5—Fruit Tree Leaf Roller: a, Moth, wings open; b, Closed; c, d, Egg patches, hatched; all life size. FIGURE 6—Pear with Howard's Scale: The young appear as minute white specks; life size. Figures from photographs by the author. Photographs by C. P. Gillette, Fort Collins, Colorado.

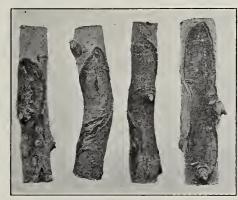
INJURY CAUSED BY THE APPLE POWDERY MILDEW

BY W. H. VOLCK, WATSONVILLE, CALIFORNIA

THE injury caused by this fungus disease is at first not very serious, only a few twigs on the tree may be attacked, and then only partly covered by the growth of the parasite. Under these conditions the tree remains strong and vigorous with undiminished productive power. Such is the condition for perhaps the first three years of the infection, but a careful observer will notice a gradual increase in the number of twigs infected from year to year. The number of leaves partly dwarfed by the growth of the fungus on the under surface also increases. This gradual increase in the amount of the infection appears at first to be due entirely to the greater amount of wintering over fungus, but there comes a time when the tree is weakened by the disease, and the parasite then flourishes more abundantly as a result of reduced resisting power of its host.

Trees which have become thoroughly infected with the mildew are characterized by the very small amount of wood growth produced during a season, and the continuation of such a condition results in dwarfing. Some of the younger orchards in the badly infected areas have been so much dwarfed as to practically stand still, a condition which will result in total loss if not remedied. Those trees which had reached the full bearing size before the advent of the mildew have not been so much affected, but nevertheless retarded and injured to an appreciable extent.

The reduction in wood growth is also accompanied by even greater injury to the foliage. Mildew-attacked trees show a dwarfed and crinkeled condition which is quite characteristic, and must, even



APPLE TREE ANTHRACNOSE

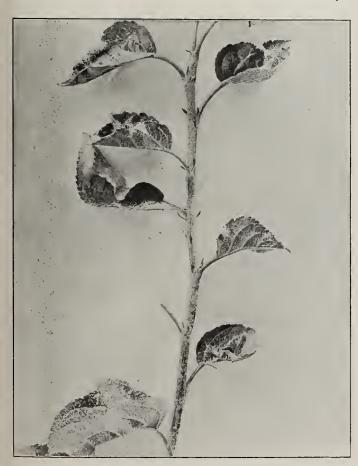
more than the reduction of the wood growth, contribute to the decline in vigor of the tree. Such a condition is doubtless responsible for a vast reduction in foliage area, greatly affects the assimilating power of the tree, and we are therefore led to the conclusion that the quantity and quality of the fruit must suffer to a marked degree. Just what the effect on the fruit has been is not fully determined. It is a matter of record that size, quality and yield have determined to the contribution of the fruit has been determined.

riorated in orchards now badly infected with the mildew, but such deterioration has also been noted where the mildew could hardy be regarded as being serious enough to cause the effect.

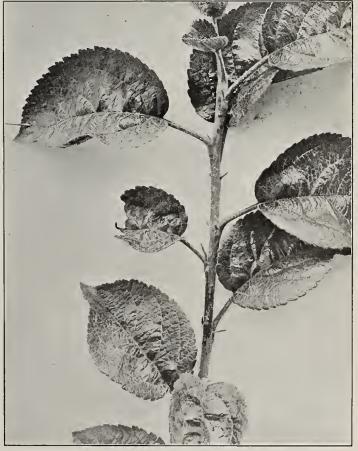
In the setting of the fruit the weakening of the buds caused by the mildew of the past season may reasonably be assumed to have a material influence. The fungus also frequently starts out during the blooming period, often infesting the stems of the young fruit. Such infection may cause failure to set. After setting has been assured the presence of mildew on the trees must still affect the fruit by reducing the assimilating or feeding power of the tree. Reduction in assimilating power may in itself be sufficient to explain the entire effect of the mildew, but it is quite probable that the trees are also poisoned by substances excreted by fungus. Mildewed orchards are not necessarily failures from the crop producing standpoint, but the condition seems to be one of gradually diminishing quality, which, in time, means unproductiveness.

The following account is not intended to be a technical description, but one that will enable the reader to recognize the disease and understand its methods of propagation.

Mildews are in general fungus parasites that grow over the surface of the host plant, but do not penetrate the tissue to a very great extent. Such penetration as does take place consists in a



NEWTOWN FOLIAGE, UNSPRAYED



NEWTOWN FOLIAGE SPRAYED WITH IRON SULPHIDE



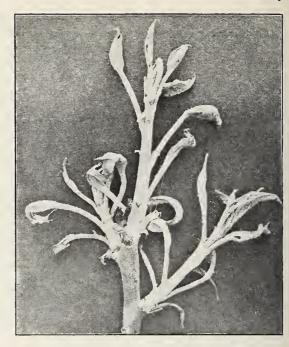
COMPLETE COVERING WITH THE MILDEW Bud that was infected after making a healthy start in the spring

few short feeders that draw substance from the plant.

The apple powdery mildew is no exception to this general rule. The parasite grows over the surface of the affected portions of the host, and so far as the observations of the writer go it has a very limited internal system. The external growth of the fungus is, however, very profuse, and affords a very ready means of recognition. This mildew often

completely covers the surface of young shoots, and gives them a decidedly mouldy appearance. Frequently there is an abundance of a white or greyish powder which can be very readily removed from the mildewed surfaces. This powder consists in great numbers of the summer spores of the fungus. At other times there are fewer spores, and the fungus has the appearance of a felt-like covering closely applied to the twig. When the twig is completely covered by the mildew the leaves have a somewhat wilted appearance, remain small and are short-lived. In this condition the

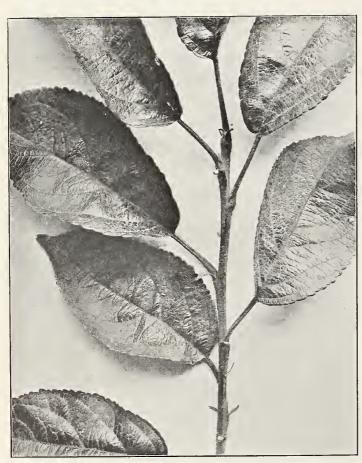
mouldy growth is abundant on both the stem and leaves. When such infested shoots are compressed in the hands they emit a very strong mouldy odor. When the mildew completely covers the shoots it has a depressing effect on the growth. Frequently the distance between leaves on the stem is very much reduced, and the growth of a whole season may be compressed to less than a half inch. In such cases the stem is usually thickened.



COMPLETE COVERING WITH THE MILDEW Buds that were infected before expanding

If, however, the attacked shoot happens to be very succulent, such as a water-sprout, the growth may be more normal as to length, but will be spindling, and the lower leaves die off, leaving only a few of the younger ones at the tip. All graduations are found between these extreme types.

The mildew does not confine its attacks to the completely infested twigs, but small infections occur on the under side

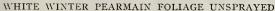


BELLFLOWER FOLIAGE SPRAYED WITH IRON SULPHIDE THROUGH THE SPRING AND SUMMER



BELLFLOWER FOLIAGE UNSPRAYED. CRINKLED AND STUNTED APPEARANCE DUE TO MILDEW ON UNDER SIDE OF LEAVES







WHITE WINTER PEARMAIN FOLIAGE SPRAYED WITH IRON SULPHIDE

of the leaves of otherwise healthy stems. Often every leaf on the tree bears these small colonies of the parasite. The effect on the leaves is a dwarfing, and often killing, of the portion covered by the fungus. This produces a curled or distorted leaf that does not attain full size.

This mildew, as has already been stated, is a fungus parasite, and the individual strands of the fungus are easily seen under the microscope. These strands are invisible to the unaided eye, but in the aggregate form the white to greyish covering before described. The individual strands of the fungus very often mat together closely and form a tough feltlike coating, sometimes one-sixteenth of an inch thick, on the infected stems.



The Standard is quite different from any other spray pump, being arranged so that it can be used either with a bucket or knapsack, or with a barrel or tank. It is useful for any sized orchard up to a thousand trees. The Standard Stamping Company, of Marysville. Ohio. will gladly send full information upon request.

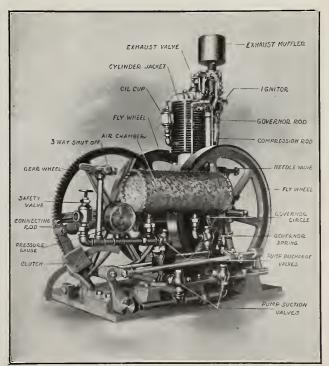
During the spring, summer, and even late into fall, the fungus produces great numbers of spores, which appear in the aggregate as a white to grayish powder, covering the affected parts. This powder is so often present as to have given the

fungus the name of powdery mildew. The summer spores are produced in countless numbers and afford the chief means of distribution of the fungus. The spores are scattered chiefly by the wind, and whenever they fall on the young growth of the apple they are capable of germinating and reproducing the disease. The stems

and foliage of the apple tree are quite immune from infection after they are three weeks or a month old, so the new colonies of the disease are found almost exclusively on very young leaves. When a colony starts at the terminal bud of a growing shoot the resulting growth is usually completely covered by the mildew. The infections which spring up on the somewhat more mature leaves are usually confined to the under surface,

but even these may at times reach the stems and cover the new growth as completely as the terminal bud colonies.

The summer spores of the fungus are a very efficient means of distribution, and account well enough for the infections



GASOLINE POWER SPRAYER Powerful, dependable, compact, and light in weight. Perfectly self-contained and operates at 200 pounds pressure. Non-heating engine.

2½ or 3½ horsepower, neither fan nor water cooled. Manufactured by E. C. Brown Company, Rochester, New York

that take place during the growing season. Wintering over, however, is accomplished in other ways, as these summer spores are short-lived.

In wintering over this fungus has two well defined methods. The first is very similar to that of the tree, that is, the parasite remains dormant upon the twigs where it was growing during the summer. The mildewed twigs are seldom killed, but often form terminal and lateral buds capable of growth. These buds expand in the spring along with the other foliage of the tree, and are usually infected with the mildew which covers them and almost immediately produces a

crop of summer spores, which then scatter the infection. In the majority of cases mildewed twigs produce an infected growth the following spring, but occasionally the new shoots are healthy, and remain so during the season.

The hibernation of the mildew on the infected twigs is the principal means of wintering over, but the fungus is provided with another method which may account for some of the early spring infections. In August, September and October dark brown patches frequently appear upon the greyish white fungus

Winter spraying for San Jose scale in the 300-acre orchards of C. M. Miller, Illinois

Spraying in the orchard of E. R. Pooley, at Hood River, Oregon

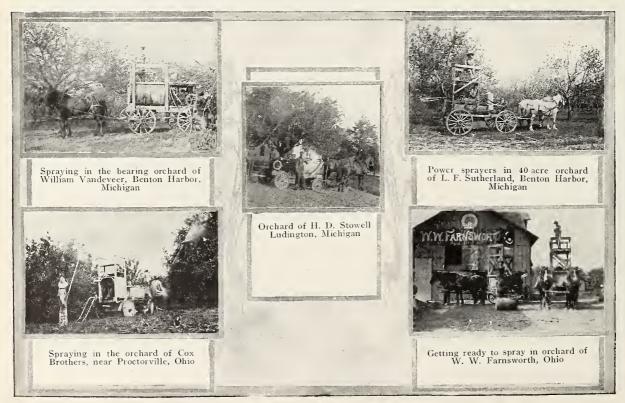
Southern Delaware orchard, showing new type sprayer in control of the showing new type sprayer in rear, though still being used

coating of infected stems. Examination under a microscope shows these patches to consist of large numbers of curiously marked and spined, spherical bodies. These bodies, known technically as perithecia, each contain eight winter spores of the fungus. Protected under the thick coating of the perithecia, these winter spores are capable of enduring considerable exposure, and under favorable conditions will germinate in the spring.

Of the two methods of wintering over. the one first described is apparently of most importance to the fungus under the climatic conditions of California, but in either case the process depends upon the mildewed twigs of the last season. During the winter these mildewed twigs are often very conspicuous, especially when the sunlight strikes them at the proper angle. Under proper conditions of illumination the whitened tips may be visible for several hundred feet.

Mildews, like other fungus diseases, are dependent upon certain conditions of heat and moisture for their development, but in general are less affected by seasonal variations in rainfall than most

other classes of parasitic fungi. The powdery mildew of the apple seems especially resistant to adverse weather conditions, and succeeds in establishing a very strong infection during seasons when the apple scab has been practically exterminated. This is due probably to the fact that the mildew is very hardy when once established, and succeeds in growing in quite dry air. Also, the summer spores are produced so constantly and in such large numbers that they are always present and able to take advantage of any favorable conditions for germination that may arise. It has been our experience that



the apple powdery mildew may safely be counted upon to be present on the trees in injurious amounts every year when once well established. In other words, weather conditions are seldom sufficiently unfavorable to the growth of the fungus to amount to satisfactory control.

So far as local experience goes, no variety of apple is immune to the mildew, but some are more injured by its attacks than others. Those varieties of delicate growth under the environment in question are more susceptible than the hardy ones. It may very frequently develop that a variety suffering little in one locality may be badly attacked in another. In the Pajaro Valley, a list of varieties, including the Newtown Pippin, Smiths Cider, Missouri Pippin, Spitzenberg, Gravenstein and Yellow Bellflower, have in general been found to be especally susceptible. Under similar conditions the Red Pearmain, White Winter Pearmain, Red Astracan, Rhode Island Greening and Langford are less badly attacked. However, these varieties cannot be rigidly placed in the above classification, for even in the limited area of the valley notable exceptions occur. Further back from the coast, and in the Santa Cruz Mountains, Newtown and Bellflowers are quite free from the disease, but Spitzenbergs and Jonathans are badly attacked.

Mildew infection and total absence from it makes a marked difference in the general appearance of the tree, and it often happens that an apple growing under mildew conditions will hardly be recognized as the same variety when found in a section free from the disease.

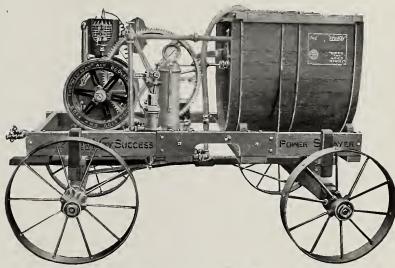
Little or no effort had been made to control apple powdery mildew in the



GIANT POWER S HAVE POWER OF SHAPE OF SH

BEAN GIANT NO. 124

One of Bean's latest models, capable of giving high pressure and large capacity
Total weight, including trucks, 1,700 pounds
Manufactured by Bean Spray Company, San Jose, California

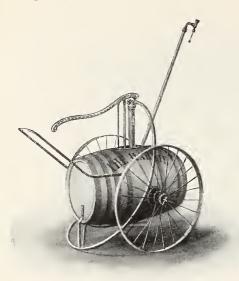


The "Success" is a very light weight, high pressure sprayer, built especially for the average sized orchard. Equipment includes 125-gallon tank and 2½-horsepower "New Way" air-cooled engine, twin cylinder, outside packed, direct geared pump. This outfit is absolutely guaranteed to maintain a continuous high pressure of 200 pounds year after year without injuring the machinery. Manufactured by the Newway Motor Company, Lansing, Michigan



BEAN PONY NO. 140

Weighs only 1,200 pounds, including trucks, and maintains 200 pounds pressure for two nozzles. Manufactured by Bean Spray Company, San Jose, California



THE HARDIE WHEEL OUTFIT Manufactured by The Hardie Manufacturing Company Portland, Oregon, and Hudson, Michigan

Pajaro Valley previous to the year 1903. At this date the Codling Moth Investigation was undertaken by the Experiment Station of the State University, and, naturally, the growers called attention to other complaints of the apple, including mildew.

The use of bordeaux mixture was at once suggested because this fungicide had already proved to be of such general application and reliability. this suggestion numerous applications of bordeaux were made, and both especially directed against the mildew and in conjunction with apple scab control work. The results of these bordeaux applications have been carefully noted for several years, and it may be quite definitely stated that this fungicide does not offer a satisfactory means of control. Even when three or four applications are made during the spring and early summer the mildew still persists, and the general appearance of the trees is not greatly improved.

Bordeaux applications scorch the mildew covered growths where the spraying has been thorough enough to insure good contact with the fungicide. In this way considerable of the fungus is killed and spore production retarded. The bordeaux mixture also doubtless kills out young colonies which are covered by the application. This fungicide, however, appears to be of too local and transitory action to give really good results with the mildew. It also has a retarding effect upon the tree growth where used frequently. We do not wish to imply that the use of bordeaux to control the apple scab need be in any way injurious to the trees. This latter effect may be advantageous to the mildew. In our experiments we have

found that any remedy to be really effective against the mildew must be neutral to the foliage growth. Indeed, growth

stimulation is something to be sought in mildew control.

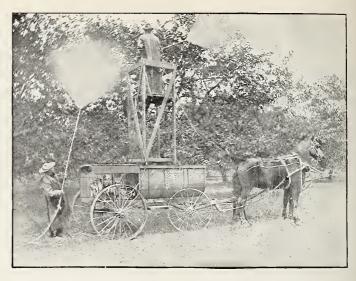
The failure of the bordeaux mixture revealed a special problem in the apple powdery mildew, and much time has since been devoted to the study of this pest. In the consideration of this problem two

principal methods suggest themselves, and may be termed curative and preventative treatments, and curative treatments include all means of destroying the parasite after it has established itself, The preventative treatments, on the other hand, include all means by which the tree may be stimulated and caused to produce a healthy growth, also the cure

of very early infections, preventing development of the disease.

In the effort to kill the growing and dormant mildew parasite the following substances and methods have been tried:

This list of substances was applied as a spray during the winter in an effort to kill the fungus on the mildewed twigs: Copper sulphate (bluestone), bordeaux mixture, sulphuric acid, iron sulphate and sulphuric acid,



Herewith is illustrated only one of the very popular models manufactured by the "Friend" Manufacturing Company, Gasport, New York, manufacturers of the celebrated "Friend" hand and power sprayers. These people are located in the famous Niagara fruit belt, where spraying is up-to-date. They are pioneers in the power sprayer line, having built the first combined engine and pump for spraying. Their keen interest in the operation of their machines accounts for their success. More than 100 of their power outfits are working in the Far West, and fruit growers are safe in putting their confidence in the "Friend." See their ad, in this issue.

lime-sulphur solution, lime-sulphur and salt, lye-sulphur solution, potash and soda lye sulphides and excess lye, lime-sulphur solution and copper sulphate (that is, copper sulphate and lime-sulphur solution), pruning off infected twigs.

Treatment during the growing season, both curative and preventative: Applications made in a liquid spray with water or as a dust, bordeaux mixture, copper sulphate (bluestone), ammoniacal copper carbonate, copper acetate, copper carbonate, copper benzoate, copper hydroxide, copper sulphide, copper metallic (finely divided), copper sulphide plus sulphur, iron sulphide, iron sulphide plus sulphur, sulphur (precipitated, powdered commercial, powdered in sand, very fine, powdered with lime, sublimed commercial), sulphuric acid, lime-sulphur solution, lime-sulphur solution plus barium carbonate, potassium sulphide, benzoates (sodium, ammonium, potassium), salicylates (same as benzoates), picric acid, phenol (carbolic acid), potassium permangenate, zinc oxide, zinc arsenite, kedzie mixture, arsenate of lead, pruning.

The list of substances mentioned under winter treatment were all applied to at



"FARMER'S FRIEND" ORCHARD SPRAYER Has 50-gallon barrel mounted upon stout truck with Deming "Century" barrel sprayer Made by The Deming Company, Salem, Ohio



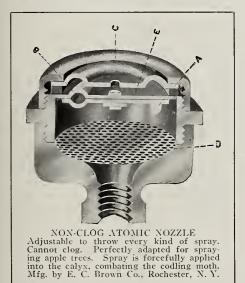


A NEW SPRAYER FOR 1911, MADE UP HERE BY MITCHELL, LEWIS & STAVER COMPANY

The Mitchell Jr. shown above is a new and from all appearances a sprayer that will prove popular among Northwestern growers. It is made up at Portland by Mitchell, Lewis & Staver Company. The outfit consists of a one-horsepower hopper cooled Stover gasoline engine. These engines have the reputation of being the most simple and easily operated engines on the market and for that reason are adapted for spraying duty. The pump is a No. 313 Myers double-acting pitman power pump, which has a five-inch stroke and is equipped for two leads of hose, with a shut-pff at the pump for each lead. The base is substantial and is strongly bolted together. This is just the sprayer for the owners of medium sized orchards. It is light and easily moved from place to place.

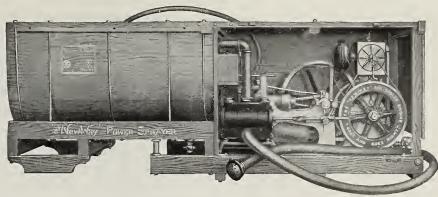
least one tree, and most of them to a number of large trees. The applications made during the growing period were in some cases only applied in small amounts with the atomizer. Such small applications are, however, sufficient to indicate whether larger experiments will be worth

Bluestone solution may be used upon dormant trees with very little danger to the plant. This solution has strong fungicidal properties, and may even kill the winter spores of certain fungi. It would seem, then, that a strong application of copper sulphate might kill the dormant fungus plant wintering over on the mildewed stems. Such applications were made during two successive years. The experiments were begun by C. H. Rodgers, and continued by the writer. In each instance the applications were made to a number of large trees of the Newtown Pippin variety, and in one case was as strong as twenty pounds of cop-



per sulphate to 100 gallons of water. These applications were made while the trees were entirely dormant, and also when the buds were well swollen.

The results obtained were quite uniform throughout, the trees were not perceptibly injured and the amount of



The "Special" has greater tank capacity, larger twin cylinder pump, with outside packed pump pistons, and 3½-horsepower "Newway" air cooled engine, and an auxiliary tank-filling pump. This outfit is built for the larger fruit growers, where continuous spraying is done. The tank can be filled in eight minutes with the auxiliary pump while the users are spraying their trees, without making a stop. Manufactured by The Newway Motor Company, Lansing, Michigan

mildew developing from the old infections was apparently the same as upon the unsprayed trees.

The copper sulphate experiments during the dormant period were in most cases paralleled by 6-4-50 bordeaux applications, giving results similar to those

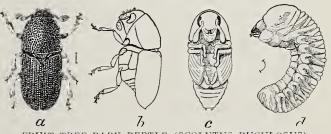
obtained with the bluestone solution. These negative results with bordeaux mixture were only to be expected when those obtained with the copper sulphate solution are considered.

Sulphuric acid, applied to sevenyear-old Newtown (small for

age); date, December 11, 1907; weather fair, temperature moderate; formula, ten per cent commercial sulphuric acid in water, applied with thoroughness to insure complete wetting of mildewed twigs. This application killed back all the twigs and the great majority of the fruit and leaf buds. The killed portions included all the mildewed twigs, so such buds as developed were free from mildew. The tree made a strong growth with vigorous dark green leaves, and none of the

shoots became covered with mildew. Numerous infections of mildew appeared upon the under sides of the leaves, especially late in the summer.

Sulphuric acid and iron sulphate: Date and conditions of the experiment the same as those for sulphuric acid; for-



FRUIT TREE BARK BEETLE (SCOLYTUS RUGULOSUS)

a, Adult beetle; b, Same in profile; c, Pupa; d, Larva. (From Chittenden.)

Attacks plum in preference, and the apple, peach and cherry are about equally attractive. Pear, quince, apricot, nectarine, mountain ash and Juneberry are also infested.

mula, 5 per cent commercial sulphuric acid and 10 per cent ferrous sulphate, with water, applied thoroughly. In this experiment twigs and buds were killed, but not to the extent as with 10 per cent sulphuric acid. A few of the mildewed twigs remained alive, and two of these put out mildew infested buds. The tree did not make a specially healthy growth and was badly mildewed by midsummer.

There has been a large quantity of spraying with lime-sulphur solution during the last two years. The strength used has been that recommended for the San Jose scale, that is the 1-1-3 and 1-1-4 formulas or their equivalent in the commercial solution. The applications have been made during the entire dormant period and under all weather conditions. It would seem, then, that this large amount of commercial spraying should afford the best possible data upon the efficiency of the lime-sulphur solution against the winter form of the mildew. Our observations have shown that the mildew develops from the infected shoots, apparently unchecked even by the most thorough lime-sulphur applications.

Lime-sulphur three times the usual strength (commercial solution 1 to 2); applied to three-year-old Bellflower; date. February 21, 1908; day cloudy, temperature moderate. The application was very thorough in the endeavor to cover all mildewed twigs. The deposit made by



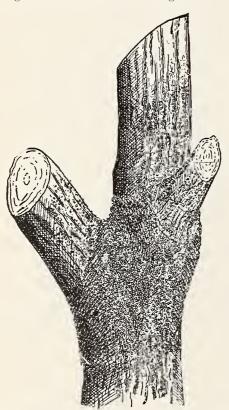
Photograph by James H. Beattie STEAM PLANT FOR COOKING LIME-SULPHUR-SALT WASH

this application remained all season, and was very heavy. The tree was apparently uninjured by the application, and the mildewed shoots produced infected growths.

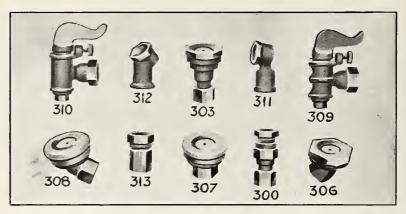
Lye-sulphur solution (a); applied to seven-year-old Newtowns; date, February 21, 1908; day cloudy, temperature moderate; formula, potash lye 2 pounds, sulphur 1 pound, water 4 gallons. Applied thoroughly in order to cover mildewed tips. This application killed greedy scale, brown apricot scale and the eggs of the canker worm. The tree developed quite normally with the exception that some of the blossom buds seemed to be retarded, the small leaves about the blossom clusters were affected by spot injury and premature falling to a greater extent than the unsprayed trees. The mildewed twigs produced very healthy growths except in two instances where infected shoots developed.

Lye-sulphur solution (b); applied to two seven-year-old Newtowns; date, March 19, 1908; day clear, warm; formula, 600 grams potash lye, 500 grams of sulphur, 4 gallons of water. The application was thorough, and killed scale insects the same as (a). The buds were beginning to expand, but were apparently uninjured by reason of the application. The mildewed twigs produced infected growths to practically the same extent as the checks.

Copper sulphide and lime-sulphur solution; applied to seven-year-old Newtowns (12 trees); date, December 2, 1908; day clear and warm; formula, 7 pounds bluestone, 6 pounds lime, 50 gallons of lime-sulphur solution per San Jose scale formula. The application was very thorough to make sure of wetting the mil-



TWIG WITH LARGE CLUSTER OF EGGS OF BROWN MITE Original. Miss M. A. Palmer, delineator. Colorado Experiment Station.



A FEW OF THE POPULAR NOZZLES MANUFACTURED BY THE BEAN SPRAY PUMP COMPANY, SAN JOSE, CALIFORNIA For description see Catalogue No. 25

dewed twigs. The results were not distinguishably different from those that were obtained by the use of lime-sulphur solution or bordeaux.

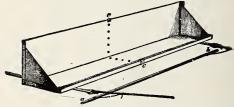
Pruning Off Infected Twigs: This method of winter treatment is theoretically efficient, but impractical unless supplemented by other means of control. If all the mildew infected buds and twigs could be removed the disease would certainly be checked, but this is impossible when the trees become large.

Reviewing the results of these winter treatment experiments, it is quite evident that no method has yet been discovered which gives even the remote hope of success. The wintering-over fungus upon the mildewed twigs appears so resistant that even most thorough applications of the strongest fungicides do not kill it. The lye-sulphur solution (a) apparently accomplished something, but (b), which was practically the same thing, gave no results. The only application destroying the mildew completely was the 10 per cent sulphuric acid treatment, and this was accomplished by killing all the twigs that supported the mildew. Considering the nature of the materials used in these experiments, it is very improbable that any substance will ever be discovered which will be useful against the mildew as a winter spray.

In experiments with substances that were applied during the grownig period

bordeaux mixture is naturally first thought of when the subject of fungicides is considered, and as has been previously stated, we have had most excellent opportunities for observing its effect on mildew. Applications of bordeaux, such as are made for the control of the apple scab, have very little permament effect upon the mildew. To control the mildew this fungicide would have to be applied very frequently, perhaps every ten days during the growing season. The cost of such frequent spraying is in itself prohibitive, but the injurious effect on the trees would perhaps be more objectionable. It is now quite well understood that the bordeaux mixture must be applied with caution and in limited amounts in order to avoid characteristic injurious effects.

Bordeaux mixture, when applied thoroughly to tender mildewed shoots, frequently kills most of the leaves within three or four days of the time of application, such applications do not, however, kill the mildew upon the stem or



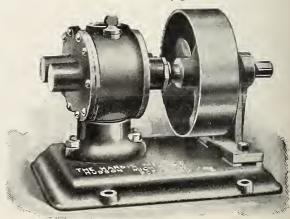
HOPPER DOZER OR HOPPER PAN (After Riley)

in the buds, so that fresh infected shoots are soon put forth.

In order to determine the effect of a single very thorough application of bordeaux the following experiment was tried:

Applied to three-year- ld Bellflower tree; date, July 25, 1907; temperature moderate, fog morning and evening; formula, 5-5-50; applied very thoroughly in order to cover mildewed twigs. The mildew was subdued temporarily, but by

Continued on page 59



PEERLESS TANK FILLING PUMP Manufactured by The Hardie Manufacturing Company Portland, Oregon, and Hudson, Michigan

There is no spraying which will cure everything. Use the ones which fit your case. For information about insects, pests, plant diseases, and spraying, write to the Botanist or the Entomologist of the Experiment Station, Pullman, Washington.

Washington Agricultural Experiment Station, Pullman

Spraying Calendar for 1911

Popular Bulletin No. 33, Jan. 1, 1911

R. KENT BEATTIE, Botanist A. L. MELANDER, Entomologist

When to Strav What to Spray for Notes What to Use This spraying may be preceded by a spraying of bordeaux as soon as crop is picked: for canker only. FALL Sulphur-lime Apple cankers Just after the leaves fall. 3° Beaume Scale insects Eggs of green aphis and red spider Pear leaf blister mite Especially for West-ern Washington Woolly aphis Eggs of tent caterpillar Moss and lichens Rahhits and field mice Write for bulletin on sulphur-lime spraying, Bud-moth: twig borer Peach leaf curl Too early spraying will miss these. WINTER Sulphur-lime While the buds are swelling Usual spraying where there is no canker Scale insects Eggs of green aphis and red spider Pear leaf blister mite Woolly aphis Rabbits and field mice Mildew 3° Beaume Write for bulletin on sulphur-lime spraying. Spray when central flower of cluster is about to open-Sulphur-lime Apple scab SPRING New York apple canker Prune brown rot or fruit mold (1) When the flower Use a bordeaux nozzle with a crook and spray with force from a raised plat-form directly into every flower. Repeat immediately. If so applied, these sprayings are usually sufficient. Keep a few trees banded. If many worms are trapped, spray. Write for codling moth bulletin. buds are ready to open Lead arsenate, 1-50 Codling moth (2) While last blossoms are falling Bud-moth: twig borer Caterpillars Sulphur-lime 1.5° Beaume Apple scab New York apple canker Not advisable to mix with arsenate of lead. Omit if there is little scab. SUMMER Aphis (cherry aphis, etc.) Woolly aphis on branches Red spider When pest appears Tobacco (or kero-sene emulsion) Oyster shell bark louse About June 15 for newly hatched young. Leaf hoppers Spray early, before they acquire wings Use 1 pound to 75 gallons; or dust with lime, ashes or road dust. Lead arsenate Pear and cherry slug Caterpillars Colorado potato beetle Use 1 pound to 40 gallons. Sulphur-lime 1.5° Beaume Fruit spot (Baldwin spot: punk rot) Early in July. (Treatment in experimental stage.) Mildew Red spider Young of oyster shell louse Trunk borer; flat-head borer Keep trunk coated all summer; best to add excess lime. Bordeaux Flea beetles Cutworms Grasshoppers As a repellant. July 1-15; repeat in two weeks. If much blight near by, give third application two or three weeks later. Potato blight Prune out every sign of blight, cutting well below the disease. Swab every cut with corrosive sublimate (1-1,000 of water). Clean the tool often with carholic acid or you will spread the blight with each cut. Set out strong plants close together, or plant the seed thickly in the rows. Give best of care, shade, and plenty of water. You will probably lessen the blight. Pear blight (fire blight of pear and apple) Western tomato blight Soak seed for two hours in formalin, 1 pound to 30 gallons of water, then cut and plant. Do not plant in soil where scabby potatoes were grown. Spray the seed thoroughly with formalin, 1 pound to 45 gallons of water. Cover and let it lie in a pile two hours. Dry and plant with clean seeder. Potato scab Pests controlled by other remedies than Smut of wheat and oats Spray soil with carbolated lime, before maggots appear. Repeat often. Cultivate well after crop is removed. Place a three-inch tarred paper collar on young cabbage plants. Root maggot of radish, turnip, cab bage, etc. Paris green 1 part, bran 40 parts; mix well. Dust the plants before the worms eat in. Cabbage worms Paris green 1 part, bran 40 parts; make a mash by adding water. Season with a little molasses, stale beer or salt. Scatter by spoonfuls before planting, or among plants. Climbing cutworms Garden cutworms Expose the roots as much as practicable and spray with tobacco, kerosene emulsion or sulphur-lime. Root treatment is not completely reliable. Woolly aphis on roots For nursery stock, use 1 ounce cyan-ide to 100 cubic feet For grafts and scions, use ¾ ounce cyanide to 100 cubic feet To every ounce of strong potassium cyanide (poison) add $1\frac{1}{8}$ liquid ounces sulphuric acid diluted with $2\frac{1}{2}$ ounces water. The gas generated is extremely poisonous. Fumigate 30 to 45 minutes.

HOW TO SPRAY

Fumigation for insects

Spray thoroughly. Direct your attention to the hardest places to reach. Cover every surface. Wet behind the buds. Reach the bottom of every crack. Fill the lower calyx cup. Do not try to economize

For all orchard spraying use a high pressure pump (at least 200 pounds). Use bordeaux nozzles only. Use an eight-foot spray rod. Have a crook to set the nozzles at an angle of 45 degrees. Spray from a tower if the trees are beyond your reach.

BORDEAUX

BORDEAUX

Bluestone ... 6 pounds
Good lime ... 4 pounds
Water ... 50 gallons
Dissolve the bluestone by suspending it in a sack
in 25 gallons of water in a barrel. Slake the lime
in another vessel, adding a little water slowly, and
dilute to 25 gallons. Mix the two thoroughly. Even
the best hordeaux may scorch in rainy weather.
For double strength bordeaux use twice as much
bluestone and lime.

TOBACCO
Tobacco leaves ... 1 pound

SULPHUR-LIME

	lime ¹ / ₂	
Water	1/0	gallon

Slake the lime in the cooker. Add the sulphur and the water. Boil briskly till the sulphur is dissolved (ahout 45 minutes), stirring continually, and keeping the cooker covered. As it boils down keep adding water. When finished let settle. Use only the clear liquid, which may be stored if kept from the air. Prepared in this way, sulphur-lime should have a hydrometer reading of about 26°, a little weaker than the factory-made product.

For use, any concentrated sulphur-lime may be diluted according to the following table:

	To Moke Dilute Spray			
Hydrometer Test		Beoume 1.5°		
of Concentrote	Sp. gr. 1.02	Sp. gr. 1.01		
Degrees Specific		1 lb. sulphur		
Beaume gravity	in 5 gallons	in 10 gallons		
341.302	to 14 of water	1 to 28 of water		
321.279	13	26		
301.257	12	24		
281.236	11	22		
261.215	10	20		
241.196	9	18		
201.158	7	14		
161.122	6	11		

ARSENATE OF LEAD

CARBOLATED LIME

Lime10 pounds
Water50 gallons
Carbolic acid
Slake the lime with a little water, add the rest
of the water and the carbolic acid.

KEROSENE EMULSION

Kerosene				
Whale-oil				
Water	 	 	1	gallon

BETTER FRUIT

HOOD RIVER, OREGON

OFFICIAL ORGAN OF THE NORTHWEST FRUIT GROWERS' ASSOCIATION A MONTHLY ILLUSTRATED MAGAZINE Published in the Interest of Modern FRUIT GROWING AND MARKETING ALL COMMUNICATIONS SHOULD BE ADDRESSED AND REMITTANCES MADE PAYABLE TO

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R. M. Winslow, Provincial Horticulturist, Victoria SUBSCRIPTION PRICE \$1.00 PER YEAR IN ADVANCE, IN UNITED STATES AND CANADA FOREIGN SUBSCRIPTIONS, Including Postage, \$1.50

Advertising Rates on Application Entered as second-class matter December 27, 1906, at the Post Office at Hood River, Oregon, under Act of Congress of March 3, 1879.

MARK TWAIN.—"The good that a man does lives after him." Great men are seldom appreciated to the fullest extent during their lifetime. Mark Twain will go down into history as a great author. His books, in their respective line, are considered to be masterpieces. "Roughing It," "Innocence Abroad, "Tom Sawyer" and "Huckleberry Finn" and others, each present certain phases of life in a very original way. In fact every one of his books is absolutely and entirely original, and different from anything else that has ever been written. The consensus of opinion is that Mark Twain was a humorist, yet everyone is not familiar with the fact that he was a philosopher and teacher as well. The editor has read nearly everything that Mark Twain has written with unusual interest, not only for the above reasons, but for the further reason that "Roughing It" is full of scenes familiar to the editor of "Better Fruit," in his boyhood days, as he was born in California. "Innocence Abroad" has been unusually interseting for the reason that the editor personally knew some of the individuals in this famous party. "Innocence Abroad" is not, as a great many people consider it, a work of fiction. While the names are assumed names, still each one represents a character of an individual who accompanied that party, with possible slight additions to make the character more interesting, or at other times more humorous.

Mark Twain met with severe financial losses during his middle age, and not only through his fault but through others through whom he invested his money. He immediately set to work with his own pen and his own brain to make enough money not only to pay off all of his indebtedness, but to make enough to be comfortable in after life, and to leave a good fortune. He was known for his generosity and kindness, and it was his wish that his works might be in the library of every family. Harper & Brothers, publishers of Harper's Magazine, Franklin Square, New York City, are carrying out his ideas in a way so as to enable every individual to get a complete set of works by Mark Twain, consisting of twenty-five volumes, for the sum of \$25, which is just one-half of the usual publishing price.

On account of our admiration for Mark Twain we are presenting this article for your consideration, and beg leave to say, should it interest you, elsewhere in this edition you will find the advertisement of Harper & Brothers, which will explain all of the details necessary in ordering the complete set.

We would consider it a personal favor if in writing Harper & Brothers you would be kind enough to mention "Better Fruit." · · ·

N ASSOCIATIONS. - The editor of "Better Fruit" for several years was manager, and is now a director, of Hood River associations.

Personally, as well as editorially, he has advanced and indorsed and recommended fruit growers' associations at every opportunity. Many districts have written for constitutions and by-laws, and have been supplied. Advice and counsel was given as thoroughly as time would permit in the hope that such, founded on experience, might be of value to the different districts.

The fruit growers in sections where associations exist know that the editor of "Better Fruit" has continually and consistently been in favor of associations, as the fruit growers in every district where no such associations exist realize.

Consequently we wish it understood that the editor of "Better Fruit" is in favor of fruit districts forming asso-District associations can be formed with one central head, which would be of benefit for the reason that under one central selling head a district can eliminate self-competition; such organization would be of benefit to a district, particularly in sections which are too small to employ proper selling ability.

Southern California has formed the Citrus Fruit Growers' Exchange, with one central selling head, which has been a great help in every way to the orange industry of that state, and it is the opinion of many that a similar organization can be perfected for Oregon, Washington and Idaho, which will be of great benefit in properly distributing fruit, eliminating self-competition and supplying all markets systematically without glutting any or shortening others.

The fruit industry of the Northwest has been going through a process of

development for quite a number of years, and, we are proud to say, improving each year. The association idea has spread rapidly. The first association was organized in Hood River in 1893. Oregon and Washington each have about twentyfive associations and Idaho ten. Many have been organized recently. It is safe to say that there are in the neighborhood of seventy-five or more associations in these states at the present time.

PORTLAND MEETING.—About 100 fruit growers from Washington, Idaho and Oregon responded to the call of Mr. H. C. Atwell, president of the Oregon State Horticultural Society, and attended the meeting held in Portland January 24th and 25th, for the purpose of forming a central selling agency, or exchange, for the Northwest States of Washington, Idaho and Oregon.

Two days were spent in very earnest discussion of the problems of marketing fruit. Nearly every feature of selling, packing and grading fruit was discussed at length, and a great many views were expressed by the growers present. The delegates came from Southern Oregon, Willamette Valley, Hood River, Mosier, The Dalles and Grande Ronde Valley in Oregon, different section of Idaho, and representatives were present from Walla Walla, Wenatchee, White Salmon, North Yakima and various other districts of Washington.

The meeting was not only interesting, but instructive, educational and developing, and was instrumental in affording an opportunity to the fruit growers of these different districts to become better acquainted; a general feeling of community interests and harmony prevailed. While some had hoped that an organization might be perfected upon short notice, it was the consensus of opinion that more time would be required to mature a plan which should be generally satisfactory to the different states and their respective districts.

A committee of fifteen representative fruit growers from the different sections was appointed, which went into session on the evening of the 24th, going into the various problems thoroughly from 8 p. m. until midnight. After the committee had thoroughly discussed every feature that had been brought up before the convention they adjourned, bringing in a report the following day recommending that another meeting be held at Walla Walla on February 28th, at which meeting it is expected that the representatives from each district will present their idea in the nature of a plan for organization, which, in their opinion, will be satisfactory to their own districts and, in general, to other districts. It will be the aim of the Walla Walla meeting to formulate one general plan from all the different plans submitted, which, it is hoped, will be so carefully drawn up that it will meet with general acceptance and approval.

It was the general opinion that the fruit growers should organize into associations in the different districts. Most of the growers present felt that a central selling agency for the three states could

Continued on page 55

\$250.00 Reward

IN GOLD COIN

The above reward is offered for competent proof that Ortho Lime-Sulphur Solution is even equaled or matched by the average output of any other lime-sulphur plant in the United States or Canada in the following points to-wit:

First: The container;

Second: The average strength;

Third: The uniformity.

Ortho Lime-Sulphur Solution is sold in 55-gallon galvanized steel drums; tests always approximately 36 degrees Beaume, about 15 to 20 per cent stronger than any other average solution. The best is never too good. The first cost is no greater than that of the weakly made. The "Ortho Way" is the best. Special prices for the month of March.

California Spray-Chemical Co.

WAREHOUSES IN PORTLAND AND SEATTLE

WATSONVILLE CALIFORNIA

Compare and Contrast these two





The one on the right shows a tree that has been sprayed with "Ortho 13" Neutral Arsenate of Lead. The one on the left is a tree which was sprayed with neutral (?) arsenate of lead "just as good" as Ortho. The leaves have almost entirely fallen; the fruit is small; not 10 per cent of the fruit will pack four tiers; the fruit buds are damaged, and the probability is that there will be no crop next year.

The other tree, sprayed with "Ortho 13"

The other tree, sprayed with "Ortho 13" Natural Arsenate of Lead, is in perfect condition; the fruit is large; 80 per cent will pack four-tier; not a damaged leaf on the tree, nor on the ground.

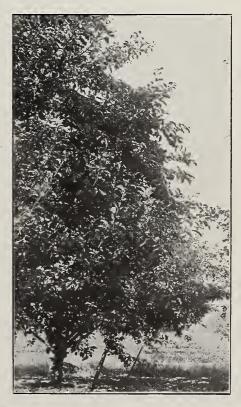
"Ortho 13" Neutral Arsenate of Lead should be used in all moist climates, such as is found in Hood River, the west side of the Cascades in Oregon and Washington and British Columbia, and along the coast in California, and on all other plants in all sections, except the apple and pear.

We want to emphasize that the California Spray-Chemical Company is an organization of fruit growers, with chemists and entomologists, for the production of perfect sprays. Our knowledge is at the command of any fruit grower.

California Spray-Chemical Co.

WATSONVILLE, CALIFORNIA

Warehouses in Portland and Seattle.



The HARDIE TRIPLEX



Is built by specialists in Spray Pump manufacturing. Years of "knowing how" and a good factory insures you a sprayer that gives you the pressure and capacity you need, and one that anybody can run successfully all the time.

A cab with curtains covers and protects your machine from weather and spray.

On account of its light weight, your team can haul it anywhere, and its low construction allows you to operate in closely set orchards without damage to fruit or trees. Our rotary propeller agitator insures you a uniform spraying mixture at all times, and this, with the even high pressure given by our Triplex Pump, gives you the highest yield of perfect fruit.

Yourself and the few tools we send with each machine constitute all the machinists and experts needed for successful operation.

Efficiency, lightness of weight, ease of operation and low cost of upkeep leave in the Hardie Triplex

Nothing to Watch but the Spray

Write today for our 56-page catalog, giving details of construction of our different sizes of power machines, hand pumps, etc.

The Hardie Manufacturing Company

Hudson, Michigan

49 Front Street, Portland, Oregon

Own an Irrigated Fruit Orchard

in the famous

Bitter Root Valley

And Provide an Annuity for Old Age

We will plant and take care of the land during the growing period, turning over to you a bearing orchard, which will thereafter yield a competence for life. Easy terms

Send for Literature

Bitter Root Valley Irrigation Co.

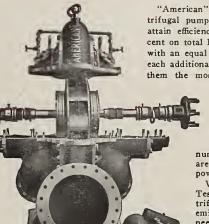
Hamilton, Montana First National Bank Building, Chicago

All the Grand Prizes and All the Gold Medals

Given by the Alaska-Yukon-Pacific Exposition at Seattle last summer to pumps were awarded to

"AMERICAN" PUMPING MACH

MACHINERY



"American" single stage centrifugal pumps are guaranteed to attain efficiencies of 60 to 80 per cent on total heads up to 125 feet, with an equal increase in head for each additional stage, which makes them the most economical pump

made for irrigation purposes.

"American" centrifugals are made in both horizontal and vertical styles, in any size, in any

in any size, in any number of stages, and are equipped with any power.

Write for "Efficiency Tests of American Centrifugals," by the most eminent hydraulic engineer on the Pacific Coast. Complete catalogue, No. 104, free.

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PACIFIC COAST SALES AGENCIES:
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341 SOUTH LOS ANGELES STREET, LOS ANGELES
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1246 FIRST AVENUE SOUTH, SEATTLE
305 COLUMBIA BUILDING, SPOKANE

Irrigation is King—

and the King of all Apples is grown in

Spokane Valley

We received "THREE FIRST PRIZES" at the Third Spokane National Apple Show, held in Spokane November, 1910, which is conclusive evidence that we produce as high grade apples as are produced anywhere in the Northwest.

In addition to this, we have an ideal climate, best of transportation, and in view of the fact that our properties are located two and a half to twelve miles from the Queen City of the Inland Empire, "SPOKANE," with a population of over one hundred thousand, affording unexcelled markets, with very best social and educational advantages, this should appeal to anyone looking for a comfortable as well as a profitable home.

Why not invest in land with all these advantages, obtainable for less money than can be bought in other districts.

Write for Booklet, "Trip Through the Spokane Valley."

Spokane Valley Irrigated Land Co.

Incorporate

NO. 401 SPRAGUE AVENUE

SPOKANE, WASHINGTON

"Within the Shadow of Mighty Mount Hood"

"Where the rain and sunshine meet"



HOOD RIVER FAMOUS COMMERCIAL PACK There grow the finest and most delicious apples in all the wide, wide world



HOOD RIVER

"THE MODERN GARDEN OF THE HESPERIDES"

Every apple picked by hand and packed in the most scientific manner under the direct and personal inspection of the Board of Directors of the

HOOD RIVER APPLE GROWERS' UNION

We take pleasure in advising the trade that for the third consecutive time practically the entire crop of this noted valley has been purchased by us. The early fall varieties are now rolling and will be succeeded within a week or two by the noble NEWTOWN PIPPIN, the delicious SPITZENBERG, the magnificent GOLDEN ORTLEY and such other varieties as grow to perfection only in the Hood River Valley.

Steinhardt & Kelly, New York

The Most Extensive Operators in High Class Fruits in the World

NATIONAL APPLE SHOW PRIZES

SPITZENBURG

Hood River won the Sweepstakes Prize at Spokane, \$1,000 in cash, for the best carload of apples, exhibited by C. H. Sproat, manager of the Hood River Apple Growers' Union, grower and exhibitor; scored 99%. Hood River won the cash prize, \$250, for the best carload of Newtowns; scored 98%; exhibited by Avery Bros., Hood River. Hood River won the cash prize, \$250, for the best carload of Spitzenbergs, exhibited by C. H. Sproat; scored 97%. Hood River won the Sweepstakes \$500 solid silver trophy cup, given by the Chamber of Commerce, Chicago, 62 affiliated bodies, for the best carload of apples exhibited, under the auspices of the National Apple Show, Spokane. This car was exhibited at Chicago. These prizes were won by members of the Hood River Apple Growers' Association, and the apples are being handled by Steinhardt & Kelly.

BEAN SPRAY PUMPS

FIRST IN POINT OF TIME



FIRST IN POINT OF **MERIT**

You're ready now to decide on a spraying outfit. You're not debating the abvisability of a sprayer-you've settled that long ago. But when it comes to the actual choosing of an outfit the average fruit grower is absolutely at sea. His confusion is excusable, too. There are so many spraying outfits on the market, so many claims and counter claims, and such extravagant advertising that the problem confronting a prospective buyer is indeed trying.

For over a quarter of a century, now, the Bean Spray Pump Co. has been manufacturing spraying outfits. It was just about twenty-six years ago that John Bean invented the spray pump having an air chamber, and erected the first spray pump factory in the United States. Since that time there have been at least thirty different sprayers put upon the market-some good, some fairly satisfactory and some absolutely worthless. Some disappeared from the market almost as soon as they were introduced, some were heard of for several years and a few of the best ones still survive. But through all these years Bean Spray Pumps have been steadily produced, and today you will find them in use throughout the fruitgrowing world.

Some twenty years ago we began to furnish our pumps with porcelain lined cylinders. Immediately competitors began to warn fruit growers against them. "They are impractical," they said. "The porcelain will soon crack and chip off," "Porcelain lined cylinders will never prove satisfac-

Despite these ridiculous assertions, we have yet to find the first Bean porcelain lined pump cylinder that

has not given satisfaction.

We use bell metal ball valves in all our pumps. However, the idea has been copied, and you'll find this excellent feature in other pumps today. But our patents are such that other manufacturers cannot use our easily removable seats and covers. In all other pumps except ours you'll find that the seats and covers screw in. Ours do not. Bean seats and covers can never corrode tight—whereas, we have often actually had to chop out the valves from some pumps that we have taken in on exchange for our outfits. Any orchardist who has ever used a spray pump knows what it means when we say that a Bean valve

can be reached in ten seconds.

There are no stuffing boxes in any of our pumps. Hence there can be no stuffing box trouble-no leaking, and squirting, and endless temper-

trying bother.

Do not misunderstand us. We do not claim to have the only good line of spray outfits. We do claim, however, that no other line embraces so many excellent features, and no line is so altogether complete. The Bean line ranges from the smallest hand pump to the largest power outfit. Our Bean Magic Pump is the only hand pump that one man can operate continuously at high pressure.

Read a detailed description in our

new catalog.

All Bean Power Sprayers have steel platforms, standard makes of engines, perfect agitation, low speed, large capacity, and are carefully tested for high pressure. All parts are made through jigs and templates, and may be ordered by catalog numbers. The various parts are, therefore, easily replaced, which means that when you own a Bean-you are liable for no big repair bills.

Decide on a Bean and you'll decide right. We deliver from nine different points in Oregon, Washington, Utah, Idaho and Colorado, and all orders are promptly handled. If there is no Bean agent in your town write direct to us for quotations and our new 1911 catalog. Tell us what kind of a sprayer you're interested in.

Bean Spray Pump Co.

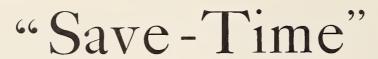
213 W. Julian Street, San Jose, California

"EVERYTHING FOR SPRAYING"

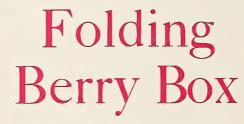
WRITE FOR YOUR COPY OF OUR CATALOG

EASTERN FACTORY: CLEVELAND, OHIO

SAVETIME



SIMPLY PERFECT



Made from Pacific Coast Spruce



AS IT OPENS

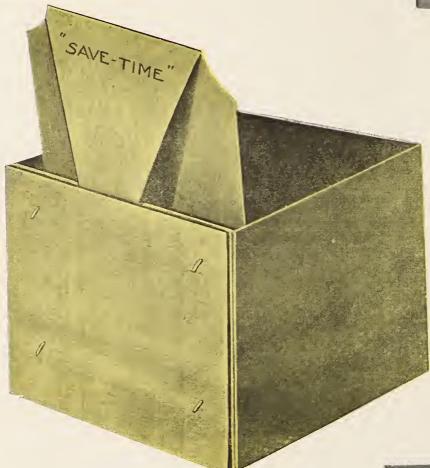
DON'T STAPLE SAVE YOUR TIME WHEN YOU NEED IT

AS IT COMES FLAT

PICKERS WILL SET UP THIS BOX IT IS SO EASY

PACKED
THREE BUNDLES
TO A
THOUSAND

ASK YOUR
DEALER OR WRITE
OUR AGENTS
OR US AND DO IT
EARLY



EASILY MADE UP

NO BREAKAGE OR WASTE

SOLID ONE-PIECE BOTTOM

VERY RIGID

NO STAPLES
IN CONTACT WITH
CONTENTS

REMAINS IN PERFECT POSITION

AS IT FASTENS DOWN

MANUFACTURED BY

Pacific Fruit Package Co.

Raymond, Washington

H. B. HEWITT, Pres. and Treas.

J. H. HEWITT, Vice Pres.

O. C. FENLASON, Sec. and Mgr.

Agents Portland, Oregon, Territory: STANDARD BOX & LUMBER CO.

East Pine and Water Streets
PORTLAND, OREGON

WASHINGTON MILL COMPANY

Agents Spokane Territory

Spokane, Washington

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT



AS YOU FILL IT

Profits Without Worry

Are you one of the many people who know the Hood River apples, their quality, and the profits to be derived from producing them?

Are you unable to share in the profits of this wonderful business because you have not enough capital to own an orchard or cannot leave your present pursuits to engage actively in apple culture? If you are, write at once for the prospectus of the Oregon Apple Company of Hood River.

This company has been organized for the purpose of rolling a profit from the growing of apples. To this end 300 acres of the best apple land in Hood River Valley has been purchased, and the scrvices of the well-known horticulturist, George I. Sargent, as manager, have been secured. Mr. Sargent will have charge of the planting and care of the tract, which insures from the outset a high class or chard outset a high-class orchard.

The capital stock of the Oregon Apple Company of Hood River is \$300,000, of which \$60,000 is preferred. The common stock has been subscribed, with which 300 acres of the best land in the upper Hood River Valley has been secured, together with the larger part of the necessary additional operating capital to be supplied by profits derived from the use of the land between the trees. In order to further assist in the development of the tract, this issue of preferred stock is being made. This stock is preferred in dividends to the extent of the first 10 per cent earned, and shares with the common stock on profits from the sale of apples greater than the first 10 per cent.

This stock is issued in \$10.00 shares and is sold at par. Should the investor wish to pay for it in monthly installments through a period of five years, he may do so by paying 20 cents per share per month for fifty months.

A discount of 8 per cent, simple interest, will be allowed for cash.

This stock is non-cumulative and non-assessable. This proposition lets you have orchard profits without the care, worry and work of operating.

It lets you have orchard profits without the usual large cash purchase price of a high grade orchard.

It gives you a high rate of interest on your savings. The operating expenses of this large tract will be much less per acre than the operating expense on a

small tract of ten or twenty acres.

The equipment needed will be much less than that needed on 300 acres subdivided in the usual ten-acre

Consequently the profits will be greater.

The assurance to the preferred stockholder rests in the fact that the common stockholders are so confident of the profits to be accumulated from these orchards that they are delivering the land, part of the running capital and services for five years, having no share in the profits from the sale of these apples until the pre-ferred stockholders have been paid their 10 per cent dividend, and are then willing to share equally with the preferred stock in all amounts greater than this 10 per cent. This acts as an insurance to the preferred stock that high class care will be given in order to accumulate profits sufficient to pay dividends on the common stock.

Write for further information today.

THE OREGON APPLE COMPANY

21 Heilbronner Building HOOD RIVER, OREGON

OF HOOD RIVER

337 Railway Exchange Building PORTLAND, OREGON

Sunnyside Nursery Company

Capital paid up, \$100,000

WE HAVE NO AGENTS SELL DIRECT

ET our prices and save G money. Trees first-class. We lead, others follow. Have several hundred thousand finest peach trees ever grown in the West. Cherry, pear and apple in numbers that foot up millions. If planted in a line would make over three rows, the usual distance of planting, from Seattle to New York city.

> WRITE US AND MENTION THIS PAPER

> > Main Office

SUNNYSIDE, WASHINGTON

Editorial-Continued from page 48

be built upon these associations, with the different districts as units for a base, with greater rapidity than if an exchange endeavored to organize on individual memberships.

It was also the idea of the delegates present that such an association should be owned and controlled by the fruit growers. The idea will probably prevail at the Walla Walla meeting to form a directorate consisting of one or more directors of associations that join the central exchange. It is to be presumed that some plan will be formulated whereby individual growers in districts where no association exists may be taken care of.

The meeting at Portland was a very enthusiastic one from every point of view, and everyone present felt that he had profited by attending it. The general impression was that good would come out of this meeting, and it is expected that the meeting at Walla Walla will develop a definite plan for organization. Fruit growers generally are invited to attend the Walla Walla meeting February 28th.

♦ ♦ ♦

7AKIMA VALLEY ASSOCIA-TION.—For some time past prominent fruit growers in the Yakima Valley have been working on a plan to organize the district associations of the Yakima Valley under a central head. The committee in charge has done some very thorough and painstaking work, and has drawn up a plan for organization which

Spring Shipping

Is nearly here, and if you have not already ordered you should do so without further delay.

By waiting till the last minute you may not get what you want, while by ordering now you will.

Send us a list of what you will need and we will gladly quote you on same.

Small or large orders quickly and easily taken care of.

Remember, our stock is guaranteed true to name, is thoroughly matured, absolutely free from pest or disease, is perfectly hardy and has a splendid root system, which insures rapid and vigorous growth.

It must please you or we both lose money.

Do not wait another minute, but drop us a postal now asking for our large catalog. It's free.

YAKIMA VALLEY NURSERY COMPANY TOPPENISH, WASHINGTON

More Salesmen Wanted

THE TROUTMAN ORCHARD HEATERS FROST'S FOE AND THE FARMERS' FRIEND

Spring Time and Frost Time are Coming! Get Busy!

T he time for experimenting and discussion has passed.

R you going to risk losing the profits in one night,

- O r will you protect your investment in preparing your land and caring for your orchard, by equipping with heating apparatus?
- U will lose more in one year from frost than the entire cost of an insurance policy in the form of orchard heaters.
- T wentieth century methods have provided against the prodigious losses incurred in the past by frost ravages, and orchard heating
- M ust be adopted and recognized as a branch of scientific and modern orcharding.

A ny one cold night and Jack Frost will reap the harvest of your N vestment. Time is short and we urge you to place your orders promptly.

WHAT HEATER TO BUY

C onfusing at first, but this problem can be solved without much difficulty.

E fficiency and Economy are what you want in an orchard heater. The necessary heat with the least expense.

Now that is what you get when you purchase the "Troutman."

This heater produces an equal amount of heat and consumes 50 per cent less fuel than any other known device.

E vidence of this important fact, which has never been denied by our competitors, is given by prominent growers all over the country, and numerous competitive tests have proved it.

R you satisfied? If not, place your order and we'll show you.

REGARDING RESERVOIRS

- D o not use large heaters for the purpose of decreasing the fire area. Use as many large heaters as you would small ones, confining their use, as it is intended, as a R eservoir. Our No. 3 "Reservoir" Heater holds six gallons and burns thirty-five hours,
- A nd we highly recommend it when used as a reservoir. Small fires well distributed are

F ar more effective than a smaller number of the large fires.

T routman Heaters are manufactured in all sizes and always give satisfaction.

THE TROUTMAN FROST FIGHTING APPARATUS IS COMPLETE

L ook at our Year Book and Government Bulletin.

E very one who has used them attests their efficiency.

A nd we can supply you with Rapid Lighters and Frost Alarms. D o not delay! The time is here.

S end us your name and we will convince you.

The Round Crest Orchard Heater Company Canon City, Colorado

it is believed will be generally acceptable to the majority of districts in Yakima Valley.

At the meeting held recently M. E. Olsen, of Parker, was elected president; G. E. C. Johnson, vice-president; W. P. Romans, secretary; E. M. Sly, treasurer; J. H. Robbins, manager, and J. T. Donan, now of Sacramento, traffic manager. The executive committee consists of Olsen, Sly, Lowther, B. D. Thompson and W. I. Huxtable.

Thirteen of the local districts have been organizing, each represented by two trustees in a central body, which will make twenty-six trustees altogether. The districts represented are the following. North Nob Hill, W. I. Huxtable, G. E. C. Johnson; South Nob Hill, Dr. Granville Lowther, J. O. Jeffrey; Granger, B. D. Thompson, R. E. Pearce; Sunnyside, H. W. Turner, Frank Schafer; Prosser, Morris Henry, W. S. Hunt; Selah, A. J. Pressey, P. W. Cornue; Lower Naches, John Doble, S. B. Shiley; Fruitvale, J. A. Adams, C. L. Miller; Parker, M. E. Olsen, E. A. Hewes; Donald, H. E. Angel, Jesse C. Childs; Emerald, J. T. Baird, M. G. Merrill; Grandview, J. M. Hogeland, E. F. Blaine.

RUIT GROWERS' ORGANIZA-TIONS.—Many reports have come to this office, and at various times we have published a notice of the different districts that have formed fruit growers' associations. Recently a great many have been formed, and we regret that we

WAGNER CREEK **NURSERY & ORCHARD COMPANY**

Talent, Oregon

Send for special prices on Yellow Newtown Apples and English Walnuts.

HEMINGWAY'S

Is the lead arsenate of the expert fruit grower. It is widely used in all of the famous fruit growing districts. Made in a factory which has specialized in arsenical manufactures for over 30 years, it has the advantage of this long experience in its preparation for the use of the discriminating fruit grower.

Hemingway's Arsenate of Lead

THE PERFECT PRODUCT

Possesses miscibility with maximum sticking power. Is 20% stronger than the federal law requires.
Send for booklet giving full directions for the use of Hemingway's Lead Arsenate against all biting insects.

KERR, GIFFORD & CO., Portland, Ore. Coast Agents, who carry full stocks

HEMINGWAY'S LONDON PURPLE CO. LTD. 64-66 Water St., New York

neglected to keep a list of those formed

during the past winter.
In the columns of "Better Fruit" we published a list of fruit growers' associations in the Northwest. We would like every fruit growers' association to look over this list and see if their name is included, and if not to send it in to us, so that our list may be made perfect, complete and up-to-date. For the benefit of the fruit industry in general it will be worth while for every association to do this, because "Better Fruit" is taken by all the principal fruit dealers, commission men and apple buyers throughout the Eastern States. This list is used in many ways-it is a directory for correspondents and many of the dealers send representatives to visit the different associations mentioned therein. By having the name of every association on this list it will enable you to get in touch with the Eastern dealers who will handle the fruit of the Northwest during the coming and future years.

Almost the whole world knows of Hood River as a place that produces the best fruits, and all of Hood River Valley should know, and could know, that there is one place in Hood River, under the firm name of R. B. Bragg & Co., where the people can depend on getting most reliable dry goods, clothing, shoes and groceries at the most reason-

able prices that are possible. Try it.

**Editor Better Fruit:*

Enclosed find \$1 for renewal of "Better Fruit."

Would not be without it. Yours truly, T. L. Lawson, Gates, Oregon.

BETTER TREES MEANS BETTER FRUIT

Nursery stock grown under careful supervision means

GREAT ADVANTAGES TO THE PLANTER

Twenty years of practical experience in the orchard, as well as the nursery business, means that we know how to grow trees that will give results. Henry Holterman, of Creswell, Oregon, says of our stock: "Of the 1,800 apple trees purchased of you last spring, we did not lose one tree. The orchard is the best, for the time being planted, of anything in this vicinity. Sold for \$300 per acre in less than six months after being planted."

Let us figure on your want list. Our prices are right. A special discount on cherry trees for a limited time—15 to 20 per cent, according to grade and quantity.

LAFAYETTE NURSERY CO.

Mention "Better Fruit"

LAFAYETTE, OREGON

"As the bud or scion, so the tree." "As much difference in trees as in cows and hens."—Thornber.

Yakima-Sunnyside Nursery Gives the Orchardist FIVE POINTERS

Plant trees propagated from bearing trees only.

Use trees with strong tops, good roots, and mature wood. Be sure roots have been thoroughly protected in digging and shipping. Know that there should be a man behind every tree. So know the man as well as the tree.

5. Lay well the foundation of your future orchard by getting the best of everything.

How to make these five points stick.

Write Y.-S. NURSERY

Sunnyside, Washington

Columbia and Okanogan Nursery Company

Wenatchee, Washington

PROPAGATORS AND GROWERS OF

The Cleanest, Thriftiest, Best Rooted Nursery Stock in the

WORLD

WHOLESALE AND RETAIL SEND US YOUR ORDER

Supplying Large Commercial Orchards a Specialty

QUAKER NURSERIES

We have a large stock of YELLOW NEWTOWN PIPPINS, SPITZENBERGS, JONATHANS, WAGENERS, ROME BEAUTIES, and all of the leading varieties of apples.

We also carry a heavy line of BARTLETT, COMICE AND BEURRE D'ANJOU PEARS.

A general stock of peaches, such as EARLY CRAWFORDS, ELBERTAS, LATE CRAWFORDS, FOSTERS, TUSCAN CLINGS, PHILLIPS, MUIR, EARLY COLUMBIA, Etc.

Small fruits in great abundance, STRAWBERRIES, BLACKBERRIES, RASPBERRIES, DEWBERRIES, GOOSEBERRIES, CURRANTS, GRAPES.

H. B. PATTERSON, MEDFORD, OREGON, Special Selling Agent for Southern Oregon.

C. F. LANSING, Salem, Oregon

NURSERY CATALOG

New, handsome, instructive, up-to-date, describing

Fruit and Ornamental Trees, Shrubs, Vines, Roses, Berry Plants, etc. Free on request. Write now, mentioning this paper.

J. B. PILKINGTON, Nurseryman, Portland, Oregon

Hood River Valley Nursery Company Route No. 3, Box 227 HOOD RIVER, OREGON Phone 325 X

Will have for fall delivery a choice lot of one-year-old budded apple trees on three-year-old roots, the very best yearlings possible to grow. Standard varieties from best selected Hood River bearing trees—Spitzenbergs, Yellow Newtowns, Ortleys, Arkansas Blacks, Gravensteins, Baldwins and Jonathans. All trees guaranteed first-class and true to name. Start your orchards right with budded trees from our nursery, four miles southwest from Hood River Station.

WILLIAM ENSCHEDE, Nurseryman

H. S. BUTTERFIELD, President

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

Editor Better Fruit:

I enclose \$1 to renew my subscription to "Better Fruit," as I value it highly. It has accomplished wonders for the fruit industry and has had much to do in placing Hood River in the most enviable place it now occupies as a fruit producing section. Wishing you continued success, I am, very truly yours, E. M. Reeves, Waverly, Iowa.

Editor Better Fruit:

You bet your life on my renewal. I have invested a number of dollars in various ways, but the hundred cents I enclose herewith are yielding the best returns. I wouldn't be without your paper, and sincerely trust that you may see fit to continue this valuable publication until time shall be no more. Yours, Alfred R. Sellenthin, Hamilton, Montana.

Editor Better Fruit:

Your kind letter and copies of the best fruit publication in the world are both here. I would like very much to swell the subscription list in Dakota, and I know I could do so. It is going to be a question with me, however, of using my limited time to the very best advantage. However, you may always rest assured that although I may not be able to represent you actively, I will lose no opportunity to boost for "Better Fruit" and its enterprising editor. Truly yours, C. Louis Allen, Aberdeen, South Dakota.

Editor Better Fruit:

Editor Better Fruit:

I believe that my subscription expires January 1st, 1911, and herewith enclose \$5—five years' subscription in advance—which is itself testimony of my appreciation of your valuable publication. Your December issue is, without exception, the best sent out. Wishing you every future success, believe me, yours truly, Guy Seaton, Spokane Bridge, Washington.

Editor Better Fruit:

Editor Better Fruit:

I enclose \$1 for subscription to "Better Fruit,"
Which is the best paper I have seen on the subject of fruit. Yours truly, Jas. M. Garmany, Allegheny, Pennsylvania.

Editor Better Fruit:

Your packing number was a splendid issue, and cnabled the writer to get a Union Packer's Number from following your instructions. Yours very truly, W. E. Clark, Mt. Hood, Oregon.

Burpee's Seeds that Grow

Plenty of stock in our 40,000 pounds Growing Plants as season requires

All makes high grade
Pruning Tools
Garden Tools
Hose and Spray Nozzles
International Stock and Poultry Food International Remedies Incubators and Brooders Everything for Building Everything for Furnishing

Stewart Hardware & Furniture Co. 22,000 feet floor space Hood River, Oregon

WE HAVE THE FOLLOWING TREES UNSOLD TO DATE

TREES UNSOLD TO DATE

These are all good, clean, strong, exceptionally well-rooted one-year-old trees. All budded or grafted from the best bearing trees in the Wenatchee Valley. Will be pleased to spring planting. Winesap, 8,340
Rome Beuty, 2,800
Delicious, 5,500
Jonathan, 4,120
Stay. Winesap, 2,000
Grimes' Golden, 530
Champion, 625
Ben Davis, 250
Transcendent, 85

TREES UNSOLD TO DATE

W. W. Pearmain, 145
Winter Banana, 695
Yellow Newtown, 160
Spitzenberg, 3,830
King David, 550
Carolina Poplar, 200
Transcendent, 85

spring planting.
Winesap, 8,340
Rome Beuty, 2,800
Delicious, 5,500
Jonathan, 4,120
Stay. Winesap, 2,000
Grimes' Golden, 530
Champion, 625
Ben Davis, 250
Transcendent, 85
W. W. Pearmain, 145
Winter Banana, 695
Y. Transparent, 50
Spitzenberg, 3,830
King David, 550
Carolina Poplar, 200
Bartlett Pear, 2-year, 800
We also have the following scions cut from bearing trees in the Wenatchee Valley in our cellar to offer, which can be shipped on short notice.
15,000

15,000 Delicious Scions 16,000 Jonathan Scions 10,000 Winesap Scions 10,000 Spitzenberg Scions

The Cashmere Nurseries Located in the Wenatchee Valley G. A. LOUDENBACK, Prop. Cashmere, Wash.

Reference: First National Bank of Chicago

Telephones Randolph 3412 3413

Gibson Fruit Conpany

WHOLESALE COMMISSION SHIPPERS' MARKETING AGENTS FRUIT AND PRODUCE

Modern Economy Revised Economy Revised Citrus

Our own Cold Storage Plant on premises Capacity 200 Cars lomy 131 South Water Street CHICAGO

Where will the Apples Go



Within ten years - even five years - the yield of apples in the great Northwest will have increased greatly over the present output. Some say 100 per cent-some say more.

Will the consumptive demand show a sufficient increase to take care of the surplus?

If not, what will become of the apples?

Oh, yes, this is theory, but just wait and see if it isn't a matter worthy of serious consideration.

We don't pretend to offer any suggestions beyond the strenuous efforts we have been making to expand the trade in box apples to the maximum. This season we have handled successfully over 1,200 cars, which have been shot to the four points of the compass. That is selling some apples, when you come to think it over-and we want to emphasize the fact that we have put all this vast array of fruit in line for "consumptive channels" with the least possible delay and expense and with quite general satisfaction to growers and buyers as well.

But what of next season, and the next?

We're thinking and planning. It is a matter of serious concern to us, this SUCCESSFUL marketing of Western Box Apples, as well as other fruits.

Those interested in getting the most for the present and the best for the future out of their ranches and orchards should not delay writing us about marketing their output the coming season, as well as hereafter.

Gibson Fruit Company

You Want the Best?

WE HAVE IT IN

TREES

They have the highest possible developed root system. It's the root which counts

No matter what quantity you may require, let us figure with you on your wants for this season, or send for our price list, and if you entrust your order with us we feel certain of retaining you as a permanent

You will get what you order

Yakima and Columbia River Nursery Co.

North Yakima, Washington

Growers of
Selected Yakima Valley Fruit and Ornamental Nursery Stock "NONE BETTER"

Salesmen — A few wanted. Write for terms

MOUNT ARBOR

E. S. WELCH. PROPRIETOR 133 CENTER STREET, SHENANDOAH, IOWA

A Full Line of

General Nursery Stock

Apple Seedlings-A surplus of No. 3, suitable for lining out.

Apple Grafts—Piece and Whole Root. made to order.

Apple—2 to 3, 3 to 4 and 4 to 5 feet.

Cherry Trees—One-year: Bing, Lambert, Royal Ann.

Peaches

Currants

Concord Grapes

Blackberries

California Privet

Roses—Splendid stock Hybrid Perpetual, Moss, Ramblers, Climbing

ORNAMENTAL TREES, SHRUBS, VINES AND FOREST TREE SEEDLINGS

KELLY'S TREES ARE TRUE TO NAME 2,000,000 TREES 2,000,000

For fall and spring planting. 350,000 Winesap, 350,000 Jonathan, 200,000 Rome Beauty, 100,000 Delicious and all other leading varieties in Peach, Pear, Plum and Cherry

Before Placing Your Order Write to

Tim Kelly, Proprietor Wapato Nursery, Box 197, Wapato, Washington

Continued from page 46

August 4, 1907, was again developing even from the thoroughly covered twigs.

In order to test out a number of chemicals at a minimum cost, the writer resorted to treating small limbs and twigs, the material being applied with an atomizer, or when dry with an insect powder gun. Such applications have the great advantage that a sufficient number can always be made to obtain average results without endangering the trees.

Fruit Trees

Jonathan, Rome Beauty, Newtowns, Spitzenberg, Grime Golden and others

Bartlett, Comice, De Anjou

Cherry Bing, Lambert, Royal Ann

Send your want list

Postal will bring Catalogue

W. C. HOPSON

MILTON, OREGON

TREES in Quantity, Price and Quality

Growers and importers of a full line of all nursery stocks—apples, pears, prunes, cherries, peaches, etc. Large or small orders—we fill all. Just drop us a few lines giving your list of wants, and receive offers which we know will interest you. Have always given satisfaction and can do so now.

We want to get in touch with planters.

CARLTON NURSERY CO.

Carlton, Oregon

Copper sulphate (bluestone) one per cent solution injured the delicate foliage, especially the mildewed growths. It did not kill mildew on the stems.

Ammoniacal copper carbonate behaved like the bordeaux mixture.

Copper acetate, one per cent and five per cent solutions, scorched young foliage and caused falling of the mature leaves. Did not kill mildew upon the stems.

Copper carbonate, copper hydroxide and metallic copper failed to give appreciable results when applied as a liquid or dust spray.

Copper benzoate yielded about the same results as bordeaux mixture.

Copper sulphide, prepared by precipitating copper sulphate with lime-sulphur solution, calcium poly-sulphide, washed free from soluble sulphide. This compound applied to mildewed growths checked any further development of the fungus for two or three weeks. Tender leaves were not scorched by the application and mildew was largely prevented

True-to-Name Nursery

Offers for fall 1910 a complete line of nursery stock, including all the leading commercial varieties adapted to the Northwest. Our trees are all grown on the best whole roots and all buds and scions used are selected from bearing and tested trees, which insures not only early bearing, but trees true to name.

write us for prices before placing your erder. We give a one-year subscription to this paper with every order of \$25.00 or more. Address

MDIID MO MANE

TRUE-TO-NAME NURSERY

Phone 2002K

Hood River, Oregon

RICHLAND NURSERY

Richland, Washington

FRUIT TREES

Complete stock of leading varieties of Apples, Pears, etc.

WRITE US FOR PRICE LIST

NURSERY SALESMEN

Drop us a line for information regarding our splendid proposition.

Big commissions paid weekly.

OUTFIT FREE

SALEM NURSERY COMPANY SALEM, OREGON from developing on the under side of the young leaves.

Iron sulphide, prepared by precipitating iron sulphate solution with lime-sulphur solution, washed free from soluble compounds. Concentration about 1.3 per cent iron sulphate. The application caused new leaves on healthy shoots to develop free from mildew, and in a normal manner. No injury to young foliage, but a few old leaves fell without wilting or losing green color. The appli-

WALNUT TREES

Mayette, Franquette, Parisienne, Etc.

Our trees grafted on the Eastern black walnut stock, are hardier and better for the Northwest as well as for Eastern planting. Write for price list and other information.

The Louisiana Nut Nurseries

Jeanerette, Louisiana

PORTLAND WHOLESALE NURSERY COMPANY

Rooms 1 and 2 Lambert-Sargeant Building Corner East Alder Street and Grand Avenue PORTLAND, OREGON

Strawberry Plants

CLARK'S SEEDLING

THE KIND THAT MADE HOOD RIVER FAMOUS

Rates:

100 plants at \$1.25 1,000 plants at \$5.00 5,000 to 10,000 plants at \$3.00 per thousand Large orders at special prices

The Quality of our Plants is the Best

F. B. KIMBALL

Successor to E. L. KLEMER HOOD RIVER, OREGON

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT



C. F. WHALEY Originator of the Ballygreen System of Certified Pedigreed Trees

BALLYGREEN SYSTEM OF PEDIGREE TREES

Selected

Certified

Combines the best practices of horticulture with honest, efficient business methods, insures the fruit grower, making it certain that he will get the kind of trees he orders and a very high quality of fruit when the trees bear.



H. W. REAUGH
Graduate
in Horticulture
Field Manager
Ballygreen Nurseries

BALLYGREEN NURSERIES

WRITE US FOR PRICES

HANFORD, WASHINGTON

cations subdued the mildew on the stems for two or three weeks.

Sulphur was used both as a liquid and dust application in a number of different mechanical forms. Precipitated sulphur and sulphur pulverized very fine in sand gave good results as a liquid application, but were much less positive when applied as a dust. Commercial sublimed and powdered sulphur, and also sulphur powdered in lime were indifferent when used as a dust application. Finely divided sulphur, applied with water, did not kill the mildew when well estabilshed on the stems, but stopped spore production for a time. Three thorough treatments did not cure the disease on a growing water sprout where the fungus covered the stem and both surfaces of the leaves.

On twigs where the mildew only covered portions of the under sides of the leaves, thorough treatment caused most of the new leaves to develop healthy. The sulphur treatment did not injure the tender leaves, but caused premature falling of some of the older or mature ones.

Sulphuric acid was used in dilution, varying from .1 per cent to 1.0 per cent. One-tenth of one per cent had no appreciable effect either upon the mildew or the foliage. Dilutions stronger than 5 per cent injured the foliage, and did not prove effective against the mildew.

The soluble sulphides experimented with were lime-sulphur solution, potassium and sodium sulphides. These sulphides used in dilutions of 3 per cent, 1.5 per cent and 6 per cent sulphur content

all scorched the tender growth, and caused considerable falling of the mature foliage. Established mildew was not killed by the applications.

Benzoic acid, ammonium, sodium and potassium benzoates were used in dilutions varying from one-tenth of 1 per cent to 4 per cent benzoic acid content. Dilutions less than .5 per cent produced no injury, but those over 1.0 per cent injured the foliage and 4.0 per cent was very injurious. Established mildew was not killed even by the strongest applications, and the young foliage on healthy shoots was not materially benefited by the weaker applications.

Salicylic acid, ammonium and sodium salicylates used in dilutions varying from .1 per cent to 1.0 per cent salicylic acid

A WARNING!!

"Probably the most important lesson that the orchardists of the Northwest have yet to learn is that cheap nursery trees are an exceedingly dangerous foundation on which to start an orchard—that a few cents economy on such trees at the start is many many dollars' loss in the long run."

Thus spoke one of America's greatest horticulturists on a recent visit to the Northwest. It is a warning that is well merited, for one can visit scarcely any of the newer fruit sections without being appalled by the number of weak, sickly, undersized young trees that stand as incontrovertible proof of his warning.

Any man who will plant anything but the strongest, most vigorous, healthiest trees—of known ancestry—trees whose breeding for generations past insure prolific bearing and disease resisting qualities is bequeathing a legacy of trouble to posterity. The first cost of a fruit tree is an insignificant cost, but the quality and pedigree of that tree is a powerful, perpetual factor to your success and those after you.

All of the nursery trees—apple stocks—of the **Hood River Standard Nursery Co.** have **three**-year-old root systems, with one-year straight tops—big, strong, healthy, vigorous trees that **will grow** when properly planted, and which will bear from one to three years earlier than the so-called "yearling" tree so promiscuously peddled about, and they will cost you little, if any, more. They are all propagated from the highest earning and best trees of the world famous **Hood River Valley**—trees whose ancestry and past performance is a matter of careful record. They are in every sense a **thoroughbred**, pedigreed apple tree.

For the season of 1910-11 we can offer a limited amount of extra size apple only. Write for catalog and price list.

HOOD RIVER STANDARD NURSERY CO.

HOOD RIVER, OREGON

content. One-tenth of 1 per cent produced very slight injury, and 1 per cent was strongly injurious, often completely killing the young foliage. Not effective against the mildew in dilutions that did not cause serious injury to the foliage.

Picric acid, when used in dilutions varying from .1 per cent to .5 per cent, appeared to have a marked effect upon the mildew without injuring the foliage. In some cases the mildew was removed from the upper surfaces of the leaves, and these developed their more normal green color, but the growth was much retarded and signs of injury ultimately developed.

Phenole (carbolic acid) seemed comparatively innoxious, both to the foliage and the mildew, when used in dilutions varying from .5 per cent to 2.0 per cent.

Solutions of potassium permanganate .5 per cent and 1.0 per cent did not appreciably injure the foliage or check the mildew.

Cooper's Tree Spray V2, a miscible oil, containing crude carbolic acid 5.0 per cent. Applied to young Bellflower tree with spray pump. This oil emulsion came recommended as a fungicide and insecticide. The application killed most of the foliage, but the fungus on the mildewed shoots remained unharmed.

Two small trees, a Bellflower and a Newtown, were sprayed with zinc oxide sufficiently concentrated to leave a very decided white deposit. The mildew was apparently unaffected and the foliage showed no injury for a considerable time, but eventually many of the leaves fell, especially from the Newtown.

To be continued in next edition.

To be continued in next edition.

Editor Better Fruit:

I enclose \$2 in payment for my subscription for "Better Fruit" for two years. It is very difficult for a man to keep track of annual subscriptions. I couldn't get along without your valuable paper, which, I think, is the very best published in the interests of horticulture. Wishing you a prosperous year, I am, yours faithfully, Thomas Cunningham, Vancouver, British Columbia.

Editor Better Fruit:

I can't do without "Better Fruit." Must have it. I get more value out of each number than the cost of the subscription. Wishing you many prosperous years, yours truly, J. II. Shawhan, Payette, Idaho.

Payette, Idaho.

Editor Better Fruit:

After February change my address to Sutherlin, Oregon, as I will from that time henceforth be an Oregonian on my fruit ranch, and could not keep house without your valuable book, so helpful to one in that business. Wishing you a very prosperous New Year, I beg to remain, yours respectfully, J. H. Cummings, Lincoln, Nebraska.

Editor Better Fruit:

Enclosed find \$1 to renew my subscription. I would not be without the paper. Yours respectfully, Edward B. Cory, Chicago, Illimois.

Editor Better Fruit:

No journal put out by any press in the world, to my judgment, equals "Better Fruit." From cover to cover it is brim full of the very best on fruit culture, cuts, advertising, etc. Indeed, it's the eddystone to orchard operations in the West and Northwest. Yours for better things, W. N. Yost, Meridian, Idaho.

All Varieties TRUE TO NAME. BUY THE BEST

BURBANK'S NEW STANDARD PRUNE

We call special attention to this new prune, a cross between the Tragedy and Sugar Prune. Best for drying and shipping. Every grower should include it in his order.

BURBANK'S NEW PATAGONIA STRAW-BERRY, the strongest grower, most productive and delicious ever produced.
California Horticulture, the Fruit Growers' Guide, 120 pages, profusely illustrated, 25 cents postpaid.

ANNUAL PRICE CATALOGUE FREE

New illustrated price list containing brief description of all stock carried by us will be mailed free if you refer to this ad.

Fancher Creek Nurseries, Inc.

Fresno, California

Geo. C. Roeding, President and Manager

P. O. Box 10

More Fruit Growers are writing us every year that they get the Best Results from

Dependable Brand Lime-Sulphur Solution

Manufactured by GIDEON STOLZ CO., Salem, Oregon WRITE FOR SPRAY BOOK AND PRICES

Montana Fruit Growers

AND OTHERS OF HIGH ALTITUDE

E are now ready to book your orders for fall and spring delivery of McIntosh Red and Wageners. For Northwest fruit growers in general, a full stock of all standard varieties—Spitzenbergs, Jonathans, Winesaps, Rome Beauties, etc., and all other kinds of fruit trees and shrubbery.

THIRTY-ONE YEARS IN BUSINESS

Milton Nursery Company

A. Miller & Sons, Incorporated

Milton, Oregon





Faculty Stronger Than Ever More Progressive Than Ever Results Better Than Ever Attendance Larger Than Ever

ATTEND THE BEST

PORTLAND, OREGON

Not Too Late Yet

If you have been delayed in securing your trees for spring planting we call your attention to the following list, which we have in one-year trees, clean, healthy and O. K. in all respects:

APPLES

Y. N. Pippin Spitzenberg Ionathan Rome Beauty Winesap Orenco Stayman Winesap Baldwin Grimes Golden Winter Banana

King Red Cheek Pippin And many other good varieties

CHERRIES

Bing Lambert Royal Ann Black Republican Early Richmond May Duke Black Tartarian Late Duke And others

PEACHES

Admiral Dewey Mamie Ross Early Crawford Muir Late Crawford Love Elberta Early Charlotte Champion

Lovell Banner

Foster Gillingham Imperial Orange Cling

And many others just as good

WALNUTS

Vrooman Franquette, guaranteed Second Generation. The most successful walnut for the entire Pacific Coast. Literature free.

ast. Literature free. Full supply of Shade Trees, Rose Bushes, small fruits, etc. Assure yourself satisfaction by patronizing the biggest and best equipped nursery in the West.

OREGON NURSERY COMPANY

ORENCO, OREGON

"Northwest" Trees Are Best

"Northwest" Trees Are Best

If you are intending to plant Apples, Pears, Cherries, Plums, Apricots, Prunes, Strawberries, Grapes or anything in the nursery line this coming Spring, insist on getting "Northwest" trees. We have all the leading varieties and every tree true to name. Place your order with us and you will get none but the best. Do it Now.

Northwest Nursery Company

G. E. MEARS, MANAGER

Nurseries: Mabton and North Yakima.

Main Office: North Yakima, Washington.

We want a few more salesmen.

A REPUTATION TO SUSTAIN

The Vineland Nurseries

CLARKSTON, WASHINGTON

Has to offer for Spring Delivery, 1911, as complete a line of Nursery Stock as can be found in the Northwest

All stock propagated from selected bearing trees.

Experts all over the Pacific Northwest realize that no other nursery exercises greater care than we do, and that

No more reliable stock is grown than we produce.

For fall delivery 1911, and spring delivery 1912, we shall have to offer for the first time the

RED GRAVENSTEIN

The New Apple Sensation

Will tell you more about this wonderful apple, which is purely a fortunate accident of nature, later on.

THE VINELAND NURSERIES CO. CLARKSTON WASHINGTON

Owners of The Hanford Nurseries

THE time is at hand, we believe, when the larger associations and growers are awakening to the importance of using greater care in selecting their spraying materials. A large and reliable house, whose business is exclusively the manufacturing of chemicals (as ours has been since 1839), equipped with experienced chemists and manufacturing the raw materials, insuring even selection and uniformity of quality, are better fitted, we believe, to turn out a high grade product than those not so equipped.

We would also call the attention of the fruit growers of the Northwest to the fact that we were the first to bring our proposition direct from the manufacturer to the larger associations. Prior to 1908, when The Grasselli Chemical Company entered the field, arsenate of lead could only be procured through indirect channels, and at a materially higher cost.

The Hood River Apple Growers' Union, who have used this well known brand exclusively for the past two years, owing to general satisfaction and good results received, have again expressed their preference and have renewed their contract for the Grasselli lead for the coming season.

The winners of the Grand Sweepstake Prize of \$1,000 for the best carload of apples at the National Apple Apple, Spokane, Washington, were as follows: 1908, M. Horan, Wenatchee, Washington; 1909, Tronson & Guthrie, Eagle Point, Oregon: 1910, C. II. Sproat, Hood River, Oregon. All sprayed with Grasselli lead.

Conclusive evidence of its effectiveness and adaptability to the varying climatic conditions which exist in these leading fruit centers of the West.

The Grasselli brand stands for high quality wherever heavy chemicals are used, and this standard will at all times be rigidly maintained. Yours truly, The Grasselli Chemical Co., Cleveland, Ohio.

Editor Better Fruit:

I am enclosing \$1 to pay for your fine publication another year. I certainly appreciate the quality and excellence of your work, and do not want to miss a number. With best wishes for continued success, I am, yours truly, Guy H. Gibbs, Cincinnati, Ohio.

Editor Better Fruit:
Your magazine should be taken by hundreds of orchard growers in this valley. Yours truly, A. R. Teeple, Roswell, New Mexico.

GET CATALOG AND PRICE LIST 420 Acres Devoted to Nursery Purposes

THE WOODBURN NURSERIES

Established 1863 by J. H. Settlemier

Grower of Choice

NURSERY STOCK

F. W. SETTLEMIER

Woodburn, Oregon

WANT BEARING OREGON ORCHARD

About 10 acres Rogue River pears, or Spitzenberg and Newtown apples in Hood River or west of Cascades. State age, price, and yield of select and choice for past three years. Must stand investigation. N. A. THOMPSON, 6030 Monroe Avenue, Chicago.

MIDWEST RASPBERRY

New glossy black, large, hardy rasp-berry. The most productive and finest flavored berry yet introduced. Send for description to

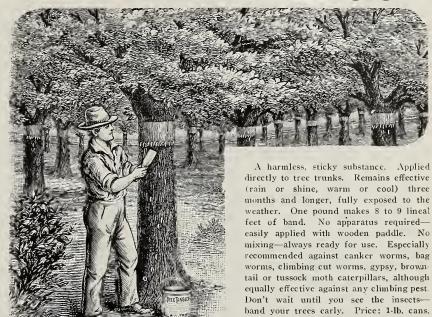
PERU NURSERY, Peru, Nebraska J. R. Duncan & Co. Box 512

Two short course students with previous experience desire employment by the middle of February in orchard where up-to-date methods are Hood River or Rogue River Valley

Address W. S., care "Better Fruit."

BAND YOUR TREES WITH

TREE TANGLEFO



SEND FOR BOOKLET

20-lb, cans, \$4.80.

30c; 3-lb. cans, 85c; 10-lb. cans, \$2.65:

The O. & W. Thum Company GRAND RAPIDS MICHIGAN

Manufacturers of Tanglefoot Fly Paper and Tree Tanglefoot

"I HAVE SO LITTLE FUNGUS

That I cannot afford to mark my fruit with bordeaux," says Mr. George T. Powell, of Ghent, New York, a grower of fancy apples. "I have less scale and finer foliage than ever before."

*Reason: Five years' consecutive use of

"SCALECIDE

Cheaper, more effective, and easier to apply than lime-sulphur Send for booklet, "Orchard Insurance"

PRICES: In barrels and half-barrels, 50c per gallon; 10-gallon cans, \$6.00; 5-gallon cans, \$3.25; 1-gallon cans, \$1.00 If you want cheap oils, our "CARBOLEINE" at 30c per gallon is the equal of anything else
B. G. PRATT CO., Manufacturing Chemists, 50 Church Street, NEW YORK CITY



Ogburn's Fruit Gathering Vessels

THE LATEST INVENTION



EXHIBIT NATIONAL APPLE SHOW, SPOKANE, WASHINGTON NOVEMBER 14 TO 19, 1910, WHERE IT TOOK FIRST PRIZE AND GOLD MEDAL

Saves money by preventing bruising fruit in handling from tree to box. Saves time by leaving both hands free to gather with, and being quick to operate. Money saved is money made.

Especially designed for apples, pears, peaches, oranges, lemons and tomatoes.

Can be used to great advantage in gathering cherries, plums, prunes and grapes. In handling small fruits, place a piece of wrapping paper in the bottom. The canvas bottom slides from underneath the paper and delivers the fruit on your packing table without the slightest injury.

This vessel is an oblong metal pail larger at the bottom than top, equipped with canvas bottom which slides from underneath the fruit, simply laying it on the bottom of the box or where desired, without disturbing the fruit, the bell-shaped pail lifting off without injuring the fruit at all.

The vessel holds one-half bushel or half box of apples, and in emptying the second time the canvas bottom eases the fruit in the vessel on that in the box without bruising or scratching, which is practically impossible with the wood or metal bottom pail.

A Number of these Vessels Given Free

Every reader of "Better Fruit" should write at once and advise number of vessels he can use in 1911. This information is solicited to secure estimate of how many vessels to manufacture, so your orders can be filled promptly. All fruit growers writing not later than April 1, 1911, will receive special order blank with terms upon which a number of these vessels will be given free. Don't fail to write now.

Special terms granted to dealers and agents in their respective trade districts. Secure your territory for 1911 now.

ALL GOODS SHIPPED DIRECT FROM FACTORY

Manufactured by

WHEELING CORRUGATING CO.
Wheeling, West Virginia
For J. H. OGBURN, Patentee

For territory and terms, address all applications to

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WENATCHEE, WASHINGTON



THE RICHARDSON

ORCHARD HEATER

CHARDSON (1174)

The Richardson Orchard Heater is the best and only up-to-date device for the burning of oil, and that gives the greatest amount of heat and smoke for the protection against frost damage or freezing temperatures of Apple and Peach orchards, Orange, Grape Fruit and Lemon groves, Vineyards, Berry patches and Truck gardens.

The Richardson Orchard Heater's Oil Reservoir is pro-

vided with cover and heavy metallic handles, and its oil capacity of 26 quarts, in most localities, is sufficient for a season's supply. They are made to nest, so as to store

After filling reservoir with oil, there is no depreciation in the quality or character of the oil. The oil that may not be used after a season's frost fighting, can be gathered

and taken to storage tanks.

The Richardson Orchard Heater's Brass Valve (specially made), the pipe connections, torch burner and fittings

are standard strength and best

quality.
The Perforated Burner, construct-

ed on scientific principles, where the oil is consumed, and the heat and smoke liberated, is one of the important features of the Richardson type. With the large reservoir and valve connection between perforated burner, a small, medium or large flame can be controlled according to weather conditions.

DRAPER OIL BURNER

The Draper Oil Burner is superior to all Frost Prevention Heaters that burn

oil in the receptacle.

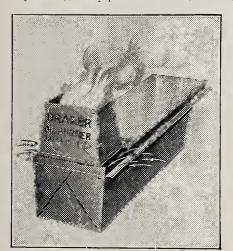
The "Draper" Seamless Oil Container, made of heavy iron, holds 18 quarts of oil; its capacity large enough to carry an oil supply without refilling, through any long period of freezing weather.

The "Draper" has a sliding cover, that, with the draft chamber on hinges,

regulates the fire and consumption of oil, according to the temperature to be controlled.

Manufactured by

Richardson Frost Prevention Co. KANSAS CITY MISSOURI



ORCHARDIST SUPPLY HOUSE

FRANZ HARDWARE CO.

Hood River, Oregon

APPLE AND GRAPE BOOKLETS

Telling how the \$5.00 a box Apples and Sweepstakes Winner Grapes are grown in the most beautiful orchard valley in the world; both booklets sent by mail on receipt of 10c, stamps or silver. Address Secretary Improvement Co., Clarkston, Washington.

Paste for Labeling

"PALO ALTO" PASTE POWDER

added to cold water, instantly makes beautiful smooth, white paste. Ready for immediate use at a cost of ten cents a gallon. No labor. No muss, No spoiled paste.

Paste Specialists

Robinson Chemical Works

349-351 Eighth Street San Francisco, California

SPRAYING TREES WITH ZINC ARSENATE OF LEAD

BY ELLERSLIE E. LUTHER, WATSONVILLE, CALIFORNIA

HE use of arsenate of lead has its advantages and disadvantages. It is a very smooth paste, mixes well, when not too dry, with water. It is readily held in suspension in water in the agitating tank; a safe poison, but it has a great disadvantage. Neutral lead is slow in killing, although insects quit feeding almost immediately after eating of it. The acid arsenate of lead, as sold throughout the Northwest and in the dry and arid sections, causes a skin trouble on the apple which has been of concern to the cold storage man.

In Mr. W. H. Volck's and my investigations in the Pajaro Valley with arsen-

icals we found that only one other common insecticide could be used with safety on plants of those we tested, and these numbered many hundreds. This is arsenite of zinc. It is a light, fluffy powder, readily goes into suspension, has a great covering power and requires little or no

This material is very soluble in the stomach acids of the insects, killing insects such as the diabrotica and the California tussock moth, most resistant to arsenicals, with ease, but, unlike paris green, it is extremely insoluble in water, and the immunity from injury to plants is remarkable. On apples it has been

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The largest commercial magazine in the West Devoted to upbuilding Oregon and the Pacific Northwest

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The Chamber of Commerce Bulletin DAVID N. MOSESSOHN. Publisher

Suite 616 Chamber of Commerce Building Portland, Oregon

Hood River Nurseries

Have for the coming season a very complete line of

NURSERY STOCK

Newtown and Spitzenberg propagated from selected bearing trees. Make no mistake, but start your orchard right. Plant generation trees. Hood River (Clark Seedling) strawberry plants in quantities to suit. Send for prices.

RAWSON & STANTON, Hood River, Oregon

Do You Want An Orchard In The Willamette Valley?

In order that we may dispose of our few remaining orchards, we offer a special inducement to purchasers in the way of transportation. This special offer, combined with our low prices, easy terms and a contract with many attractive features, makes this a bargain not to be found anywhere else in the fruit growing districts. They will not last long.

Write for descriptive literature and details of this special offer.

OREGON APPLE ORCHARDS CO.

Eastern Office, Bloomington, Illinois Western Office, 432 Chamber of Commerce, Portland, Oregon

sprayed as thick as heavy whitewash without the least bit of injury. On small field crops, such as beans, potatoes, etc., it has given no injury, but on the peach, which is supposed to be more hardy than the bean, the injury was severe.

In the Northwest, and in all dry countries where codling moth breeds abundantly, stung apples are in great number. These apples are not wormy, but since the codling moth has left its mark they have to be rejected from "quality first." Zinc arsenite will prevent all this; it will give apples free from stings; it will raise the grade of the orchard run of fruit materially, and will lower the cost of spraying, as the equivalent of twelve cents of arsenate of lead can be

purchased in this material for less than five cents

After discovering the applicability of this material as an insecticide, Mr. Volck and myself have proceeded slowly in the matter of recommendation until we were thoroughly satisfied with the material from the safety standpoint. As regards safety, zinc arsenite stands between neutral arsenate of lead, a material which absolutely will not injury the foliage however thick it might be applied, and acid lead arsenate, which is considered safe in most of the Northwest section. So here stands a material with safety as regards arsenical injury, in between neutral arsenate and acid arsenate, accomplishing perfect control of the codling moth, with the freedom from worm stings, at a considerable less cost.

For the last two years various orchardists have tried this material, and in every instance it has displaced arsenate of lead. Government experts have used this chemical with fine success upon hard killing insects. The Montana Experiment Station has found it to be the least injurious to the soil of all which they have tried.

B OOMING THE APPLE.—Speaking of apples, they know how to boom the fruit in Oregon. They had an apple show in Portland last week, and while it was in progress one of the leading restaurants had on its luncheon menu the following: Apple consomme, apple salad, roast apple with hot sauce, baked apple with cream, apple dumpling with cream, apple pie with whipped cream, apple pie with cream, apple pie a la mode.—Exchange.

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Mr. Edwin C. Tyson of Flora Dale, Pennsylvania, sold \$960 worth of apples from 54 trees that 5 years ago he con-sidered no good and started to take out. These trees have had nine successive applications of "Scalecide."

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These additions to The Stark Year Book have quite naturally delayed its date of issue a trifle—from January 15th to February 1st—but its readers will be well repaid for the slight delay. More than ever, The Year Book becomes a complete volume of the most helpful and practical guidance to the orchardist and fruit grower.

Two special features of The Stark Year Book deserve special mention. Where practicable, we have appended to our own descriptions, made from first-hand experience and close observation, the experience and observation of many other horticulturists. We have thus hoped to give to them that degree of definiteness and accuracy which is possible only when a description stands side by side with the weightiest possible evidence in support thereof.

We have also tried earnestly to meet many another practical difficulty of the beginner as well as of the more experienced—in a word, afford him the opportunity of getting what will be the best of all aids to success—a condensed knowledge of the whole subject.

If you have not already sent for your copy of The Stark Year Book for 1911 do so at once—fill in and send us the coupon today. Postage 10 cents. The demand for Volume II is tremendous; the edition is limited, and probably will not be reprinted when exhausted.

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LACKLEA

From O. E. BREMNER

Secretary of California State Commission of Horticulture:

Culture:

I am convinced in my own mind that "Black Leaf 40" will prove a great success on young lecaniums and other soft-bodied scale insects, also white fly larvæ (A. citri), when used in combination with a small amount of oil emulsion or soap.

I have seen its efficiency thoroughly tested on thrips, and have used the same combination, "Black Leaf 40" and 2 per cent oil emulsion, or red spider with remarkable success.

I have also used "Black Leaf 40" in combination with arsenate of lead for calyx spraying of apples, and not only prevented the attack of codling moth, but completely controlled the curl leaf aphis, which has been such a destructive pest for the past few years.

From W. H. VOLCK

Entomologist for Montercy and Santa Cruz Counties, California:

I have conducted a considerable number of experiments with "Black Leaf 40," mainly to determine its efficiency in the control of aphids, including the green aphis and the woolly aphis of the apple. All of these tests have proved the material to be highly satisfactory for the purpose mentioned.

purpose mentioned.

I consider your "Black Leaf 40" better for general use than your "Black Leaf" Extract, since the amount of organic matter other than nicotine is reduced to minimum. "Black Leaf 40" can be used without leaving any stains or marks on the fruit, which is strongly to its adventure.

I find that one part of "Black Leaf 40" to 2,000 parts of water containing cresol soap is very effective in controlling all kinds of

I shall recommend its use in preference to any other form of extracted or concentrated nicotine.

From FRED L. YEAW

California Agricultural Experiment Station:

I used your "Black Leaf 40" against soft-bodied insects, using the formula published upon your wrappers; the results were all that could be desired, the spray acting very quickly.

The "Black Leaf 40" would seem to be a very desirable kind of tobacco spray to use, because of its known strength and non-volatile qualities.

From ELMORE CHASE

Deputy Horticultural Commissioner, Fair Oaks, California:

We have used "Black Leaf 40" straight on a small block of olive trees for the black scale (Scaisseta Oleae), and after two weeks we found every scale dead on the leaves which did not escape the spray. For aphis it is a complete remedy. We are using a little from one package with distillate emulsion for the scale of the olive.

From PROFESSOR H. J. QUAYLE

Entomologist California Agricultural Experiment Station:

We have tried the "Black Leaf 40" on plants of various kinds for aphis, and find it entirely satisfactory for killing these insects.

From PROFESSOR C. P. GILLETTE

Colorado Agricultural Experiment Station:

I have found a thorough application of "Black Leaf 40" in the proportion of 1 to 1,000 to either green apple aphis or the woolly apple aphis will kill 100 per cent of those actually treated.

From GEORGE P. WELDON

Field Entomologist Colorado Agricultural Experiment

Station:

Have experimented with "Black Leaf 40" for the past two seasons, and am satisfied that it is just as effective in killing the various species of plant lice as "Black Leaf" Extract, which has for a number of years been our standard remedy in Colorado for these insects.

From PROFESSOR W. S. THORNBER

Washington Agricultural Experiment Station:
We are trying "Black Leaf 40" in various ways in our experimental work, and have found it very satisfactory so far.

From DR. JOHN B. SMITH
Entomologist New Jersey Agricultural Experiment

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"Black Leaf 40" (Sulphate of Nicotine) proved satisfactorily effective on green plum aphis at the rate of one ounce to eight gallons of water (a dilution of 1 to 1,024).

From H. B. FULLERTON

Director Agricultural Development, Medford, Long

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Your "Black Leaf 40" has proven very valuable to us this year.
We have used it in combating aphis, which this season have developed in unusual numbers and representing a very great number of varieties.

From A. W. MORRILL

Arizona Horticultural Commission:

It is my impression so far that for general purposes the strengths that you recommend for "Black Leaf 40" are about correct.

From GEORGE A. LAMIMAN
Horticultural Commissioner, Anderson, California:
"Black Leaf 40" seems to be a good remedy for the vine hopper on grapes. It did good work on aphis, also on thrips in general.

From PROFESSOR C. E. SANBORN

Entomologist Oklahoma Agricultural Experiment Station:

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"Black Leaf 40" is a concentrated solution containing 40 per cent nicotine by weight, in the form of nicotine

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PESTS UNKNOWN TO COLORADO FRUIT GROWERS

BY C. P. GILLETTE COLORADO AGRICULTURAL COLLEGE, FT. COLLINS, COLORADO

HERE do our insect pests all come from? Do they spring spontaneously from the soil and moisture under the influence of the heat and light of the sun, as the ancient Greeks supposed many living things came into existence? Are new species continually being developed, or how is it that there is an insect to destroy every kind of a plant that man grows? Such questions as these often perplex the gardener, the farmer, the orchardist, and even the nurseryman. There are those present who can well remember when the Colorado potato beetle was unknown as a pest, when the San Jose scale was without a name or a record, when the dreaded Gipsey and brown-tail moths had not yet done any injury to the forest or other trees in the New England states, and when even pear and apple blight had not yet attracted the attention of the orchardist in the Middle and Western states. In fact many of our insect pests and plant diseases seem to be of comparatively recent origin.

Probably it is unnecessary to state that no insect, however minute, ever springs spontaneously into life, no matter what its environment or how favorable the conditions for its nourishment and propagation. Every insect, like all higher forms of life, is born or hatched from an egg of a parent like itself. The natural conditions in Australia for the develop-

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may be due to one or more of several ment of rabbits, and the conditions in the United States for the development of the English sparrow must long have been of the best, but neither of these creatures occurred in the countries mentioned until men first introduced them. Likewise the San Jose scale did not appear in California, nor the codling moth in Colorado until someone took these insects into these localities.

Then, when an insect before unnoticed, suddenly appears in injurious numbers upon some cultivated crop it does not mean that a new form of life has sprung into existence. It does mean one of two things, however. Either the conditions for the development of this insect have suddenly become more favorable, or the insect is one that has been introduced into the locality from some distant point. If the insect is one belonging in the region its increase in numbers causes, such as reduction in the number of its enemies, more favorable climatic conditions for its healthy development or a more abundant food supply.

It is from such causes as these that most of our insect pests arise. When white men began to plant potatoes on these Western plains they furnished a suitable and abundant food supply for the

J. F. LITTOOY

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Orchard director, orchard schemes examined, orchard plans submitted, orchard soils and sites selected, nurseries visited and stock selected, values examined for farm loans, purchasing agent for land and orchard investments, acts as power of attorney in selection of Carey Act lands.

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Colorado potato beetle, which for centuries had only been able to maintain its existence upon the scattered plants of the wild species of solanum, native to the region. As a result of an abundant food supply this insect increased in numbers so rapidly as to get away from its natural enemies, and it soon made its way along the courses of the great transportation lines to the Atlantic seaboard, and even took ship and went to Europe, where it estabilished thrifty colonies in defiance of the laws of extermination passed against it.

The plum curculio, the plum gouger, the apple curculio, the peach borer, the chinch bug of our prairie states, our destructive locusts or grasshoppers, many of our cut worms and destructive plant lice and numerous other crop pests come in this same class.

However, many of our very worst insect pests are those that are not native to the region, but which are in some way brought into it from a distant locality, perhaps a foreign country, from which it is separated by some natural barrier, such as a large body of water, a mountain range, a broad stretch of prairie or many degrees of latitude having a much warmer or colder climate.

If an insect can by some means be taken entirely out of its native habitat and placed in a region where some suitable food-plant occurs in abundance, that insect is almost certain to increase very rapidly and become a serious pest, for the reason that it has escaped from the natural enemies that held it in check in

its original home. As examples of such insects we might cite the Gipsy and the brown-tail moths. For untold ages they had fed upon the trees and shrubs of Europe, but on being brought to this country they experienced no difficulty in substituting as their menu almost the entire flora of Massachusetts, including some of the evergreens, and they have increased with such rapidity as to almost render futile man's attempt at their control. Their tremendous increase in numbers was not due to any superior nutritive value of the foliage of our trees, nor to more favorable climatic conditions, but to the simple fact that they were taken away from their natural enemies, especially the parasitic and predaceous insects and the birds, and perhaps fungous and bacterial diseases as well, that under European conditions kept them from doing very much harm.

Listen to the familiar names of a few other insects of this class: The codling moth, green apple aphis, woolly aphis, San Jose scale, oyster-shell scale, peach bark louse, green peach aphis, currant saw-fly, green cabbage worm; and the list might be greatly extended.

In states where nearly every orchard malady is quite generally distributed quarantine laws may not be very important, but in a state like Colorado, occupying the unique position that it does, with a broad stretch of semi-barren plains as a barrier on the east, a high mountain range as another barrier, running north and south through its middle portion, and a stretch of barren moun-

tainous country on the west, and having its orchard sections in small mountain valleys isolated from one another, and with the handicap of a long and expensive haul to market, quarantine regulations to keep out insect pests and plant diseases become a paramount issue. While our soil, our climate and our ability to control the water supply to the land are all conditions greatly in our favor, our orchardists could hardly compete favorably with their Eastern brothers, who are situated in close proximity to the large centers of consumption, if they had to combat all the orchard pests and plant diseases that annoy the Eastern grower to make his crop unprofitable. When the writer came to this state even the codling moth was unknown in some of the large apple growing sections, and fire-blight, or pear blight, was unknown east of Denver and Pueblo. The moth was gradually introduced from point to point through the shipment of wormy apples into the state, and blight through the shipment of apple and pear trees bearing the germs of the blight organism (bacillus amilivorus).

But I was to tell you of the troubles we do not have. I shall mention only those that are known to occur in other parts of the United States. As they are enumerated you will be helped to understand how it is that our orchard lands can be so high in price and our orchardists still able to make good money on their investment, and also why the state entomologist and his inspectors are as strict as they are in taking measures to



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In a competitive test held at Roswell, New Mexico, January 2, 1811-

The Bolton Heater burned 8 hours on 5 quarts of oil; cost, delivered, 20 cents each. The Hamilton Heater burned 4 hours and 25 minutes on 5 quarts of oil; cost at factory

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At Winter Park, Florida, January 13, 1911, it took 112 Hamilton Heaters holding three gallons each to create as much heat as 100 Bolton Heaters holding only five quarts each.

These figures but tell a story that has become old by its repetition. The Bolton has so decisively defeated all heaters demonstrating against it that there can no

one million Bolton Heaters and longer be any doubt as to the relative merits of each.

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mate the results that the Bolton gives.

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prevent the introduction and spread of insect pests and plant diseases in the state of Colorado.

A total list of the insects injurious to fruit in this country, but which do not occur in Colorado, would be too lengthy. I wish to call attention to the following important ones only.

The scurvy bark louse, the white peach scale, the round-headed apple tree borer, the shot-hole borer, the apple maggot or railroad worm, the plum curculio, the canker worms, the American tent caterpillar, the forest tent caterpillar, the tussock moths, the brown-tail moth, the Gipsy moth, the elm leaf beetle, the rose chafer, the imported currant saw-fly, the grape-vine fidia, the grape phylloxera. The San Jose scale is known upon a few trees only in a single locality, and the oyster-shell scale has been found in one of the Denver parks and in a few instances upon shade trees only. It is not known as an orchard pest.

The apple curculio has been taken in one locality on the eastern slope only, the peach crown borer is known in three very limited districts only and the black peach aphis has only been known in a very few orchards.

When to this list of our worst orchard insects that are practically unknown in Colorado we add such diseases as apple scab, bitter rot, peach yellows, little peach and shot-hole fungus as unknown orchard troubles, it can readily be seen that we live in a sort of fruit growers' paradise, from which we must exclude. so long as possible, the insect pests and





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Gentlemen:— Enclosed find 10c in stamps for which please send me your Trial Offer of 3 fine packages of "North-ern Grown Seeds."

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plant diseases that we do not already have. If an insect or plant disease once gets a good start in a community it is rarely, if ever, exterminated from that section

It is the wish of the writer that in the work of quarantine against the introduction and spread of insects and plant diseases that make fruit growing unprofitable exact justice might always be done to both the nurseryman and the orchardist. Occasionally the nurseryman will have trees condemned that should have been passed, while in other cases—and these are few—trees unfit for planting because of contagious maladies slip through the inspector's fingers to the injury of the grower.

There are two very serious nursery stock troubles that I wish to speak of briefly in closing. These are woolly aphis and crown gall. Last year our inspectors condemned and destroyed about 30,000 nursery trees that were affected by these troubles. Let me be very frank, and I am sure you will recognize the fairness of my position, when I say we must deal severely with both these troubles. An apple tree has a hard struggle, and then cannot do its best, when its roots become infected with woolly aphis after the tree has become well established in the soil, and the setback that the tree struggles against when these little parasites are planted with it is far greater and occasions a loss to the owner that is many times more than the first cost of the trees. And then there is little or no excuse that tree roots should be shipped with living woolly aphis upon them, for a fairly thorough fumigation with potassium cyanide gas will destroy them all.

Crown gall is not so easy to control. There are growers of nursery stock who do not hesitate to say that it occurs in all nurseries, no matter where they are located. This is undoubtedly true of all nurseries that ship in from distant points the trees, or a considerable portion of them, that they grow. The writer knows of two or three nurseries handling almost exclusively home-grown stuff in which it is almost impossible to find a tree with crown gall upon it. However this may be, this contagious malady, produced by a specific and minute organism (pseudomonas tumefasciens), is so severe in its effects upon fruit trees in the arid climate of Colorado that we must refuse to receive, in this state, any and all trees affected with it. In my judgment, if a considerable proportion of the trees in a shipment are infected with crown gall an inspector would be justified in condemning the entire bundle, for in such cases it is almost certain that there are trees in the lot that show no visible indication of the galls that really are inoculated with the organism, and will develop the disease after they are planted.

We do not wish to make the nurseryman any trouble or occasion him any loss, and we do wish to protect and foster our important and rather extensive fruit growing industry, and for these reasons I thought it best to state our position very frankly to this large body of men, who are likely to be offering their goods for sale in Colorado, in order to avoid annoyance both on your part and ours. Our orchardists are usually ready to pay a good price for good, clean, healthy trees, but poor, diseased or infected trees are not wanted at any figure. My wish is that the nurserymen and inspectors might pull together in harmony to give the fruit growers nothing but the best of clean, healthy trees, for then the profits of fruit growing would be increased, a larger acreage of trees would be planted and the benefits derived would be mutual.





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If an old reliable nursery is of any specific importance to the prospective planter, we kindly ask you to consider with us before buying your trees.

Albany Nurseries

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EXPERIMENTAL WORK IN WESTERN COLORADO

MEETING of fruit growers for the discussion of problems relating to the conduct of their busines would scarcely be complete without a discussion of the codling moth. While this is one of the oldest pests of our orchards, and one that nearly every entomologist who has ever worked in orchards has experimented upon, it is still one of the most serious. One season the apple grower meets with success in controlling it and prides himself of the fact that he has solved all the problems relating to its control, the next season he sprays in exactly the same manner, as far as it is possible for him to tell, as he did when he met with success, but finds that something is wrong some place, and he has failed in that which he felt so sure would bring the required results

Exeprimental work is of little value unless the same experiments are conducted for a number of seasons, for there are too many factors which influence the results of an experiment that may be operative in one season and not in another to place much dependence upon the work of a single season. Without advancing any ideas that are entirely new or startling, it is the writer's purpose to submit data in this article gathered from the past three years of experimental work on the western slope of Colorado, which will go toward proving three propositions, which are: 1. The one-spray method can only be suc-

GEORGE P. WELLAN, at Annual State Horticultural Convention of Colorado, December 12, and 13, 1910 cessful in controlling codling moth in orchards where there is a natural scarcity of the pest throughout the season. 2. The specking of fruit cannot be prevented during a season of severe codling moth attack, no matter how much arsenate of lead is applied. 3. Thoroughness in applying the spray is a much more important factor than the quantity of arsenate of lead used per given volume of water.

Taking up the first proposition, by the one-spray method is meant one thorough spraying after the petals have dropped from the blossoms and before the calyx lobes have folded in, thus doing away with the so-called calyx cup, into which the first spray should be driven. Considerable has been written in recent years about the one-spray method, and while some have concluded that only one spray is necessary, and have failed to make any allowances for different seasons, or different sections, the more conservative have realized that such a method could not hold good in every locality and in every season. If this is true, how can we lay down any rules in regard to the number of times that an orchard should be sprayed in a season that will hold good at any time and in any place, no matter what the existing conditions may be? From the past three years' experimental work on the western slope, and from observations made in a great many orchards, this fact seems apparent: No rule in regard to the num-

In the fight to preserve your fruit trees, be sure that your ammunition is right; when the crop is in danger, isn't the time to do any experimenting.

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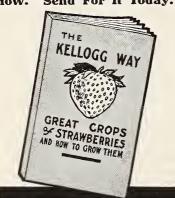
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ber of sprays that should be applied in any one season can be laid down that will not be subject to seasonal and locality variations. To illustrate this point a comparison of results attained in last year's experiment is made with results attained in this year's experiment.

It will be remembered by many of you, that last year it was possible to control codling moth very effectively in many localities of the western slope with only one spray. This year it has been found necessary in those same localities to spray three or more times, and in most cases with poorer success than last season. A striking example of this was noted in the locality where the experimental work was done last year. In that particular locality no one, to my knowledge, sprayed more than once, and practically everyone was so successful that from 90% to 99% of their fruit was free from worms or worm specks. The experimental trees were sprayed only once, but very thoroughly, and an average, estimated from actual count of all apples from nine trees, of 951/2% of

WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

the fruit free from worms or wormspecks was attained. With an average such as this any further spraying during the season would have been a ruthless waste of time and money. The fact that so large a percentage of the fruit was good could not be attributed to the spraying had there been no comparison

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AMERICAN BEE JOURNAL Chicago, Illinois of the sprayed with unsprayed trees. In this block there were thirteen unsprayed trees, all Ben Davis, the same variety as those sprayed, and the average percentage of sound fruit, determined by actual count of all apples from a number of trees, was 52, so that there was no doubting the fact that only one spray had resulted in a saving of 431/2% of the fruit. It is well to note here that the wormy fruit of the check trees, while it was spoiled for the first grade pack, was not excessively wormy, as it would have been in a season of severe codling moth attack, most of the apples having only one worm-hole in them. The experimental orchard, along with practically all others in that section, was much more wormy this season, with from two to five sprayings instead of one, due partly no doubt to the light crop of apples, but due principally to the great abundance of worms which seemed to find everything favorable to their development.

This year's experiment was conducted in a locality where there was an average crop of fruit and an abundance of worms. It was found to be absolutely impossible to keep down the worms in this orchard with only one spraying, and where last season 951/2% of the fruit was saved with one spray, this season 221/2% of the fruit from one Ben Davis tree was free from worms, and much of it was also wormspecked. In this orchard one Ben Davis tree left unsprayed had 17.4% of its fruit worm free. Thus the benefit of the one spray was only 51/10%, in all probability because of the fact that the percentage of the worms which enter the side of the fruit, usually estimated at about 25, was an exceedingly large number, and there was nothing to keep them from going in. There was no doubt but that the arsenate of lead was good, and the calyx spray effective, for out of 2,362 apples from the tree sprayed once only 17 were wormy in the calyx, while out of a total number of 1,366 apples from the unsprayed trees 679 were wormy in the calyx. The best results attained in this orchard were with the use of four sprays, which kept 83% of the fruit worm free. Much of it was, however, specked.

This brings us to the second proposition: "The specking of fruit cannot be

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WESTERN AGENTS

PORTLAND, OREGON

prevented during a season of severe codling moth attack, no matter how much arsenate of lead is applied." The general complaint throughout the fruit sections the past season was that even though the worms failed to gain an entrance for any distance into the fruit they succeeded in eating enough to leave specks. The specking of fruit is caused almost entirely by worms that have been killed by the poison, but which fed for some little time after taking the fatal dose. For my part I cannot see how specking of fruit can be prevented during a season when codling moth is abundant. The larvae cannot be killed unless they get some of the poison into their systems, and in order to get some of the poison they must feed upon a portion of the apple covered with the poison, or on the poison itself, with none of the apple. It is, of course, possible that some worms are killed by eating poison from the skin of the apple before it is pierced, but as arsenate of lead is a somewhat slow acting poison and does not kill immediately upon being taken into the body of the insect, in most cases a worm will feed for some time underneath the skin of the apple after taking the fatal dose, and as a consequence we have an apple that is specked, is not strictly fancy and cannot be packed with our best grade of fruit. Sprays applied late in the season, while they may keep the worms from getting in and totally destroying the fruit, bear a direct relation to the number of worm-specks upon the fruit. This

Greider's Fine Catalog of pure bred poultry, for 1911, over 200 pages, 57 large colored pictures of fowls. Calendar for each month: It-lustrations, descriptions, photos, incubators, 1 rooders, information and all details concerning the business, where and how t buy fine poultry, eggs for hatching, supplies, etc., at the lowest cost, in fact, the greatest poultry catalog ever published. Send 15c for this handsome book.



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GRAY'S NURSERY

Dept. "B"

Pekin, Indiana

point was nicely illustrated in this season's experiment by two Ben Davis trees, one sprayed only once and the other four times. The tree that was sprayed only once yielded a total number of 2,362 apples, 144 of which were specked and 1,813 wormy. The tree that was sprayed four times yielded a total of 1,282 apples, 618 of which were specked and 219 wormy. Examples of this kind could be multiplied, but it is not necessary to do so in this paper.

Orchard and Vineyar

Harrow Model R

Book 46-R

Book 46-C

Book 46-D

Book 46-F

The fruit grower realizes that the specking of api les is unavoidable during certain seasons of severe codling moth attack, and has tried to overcome the difficulty by the use of a very strong spray of arsenate of lead or other arsenate. While it would seem that such a method might result in some good, careful experimental work and careful investigations in many orchards failed to indicate in the least that a strong spray is a solution of the difficulty, but did indi-

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ARMER!

cate that in the words of the third proposition laid down: "Thoroughness in applying the spray is a much more important factor than the quantity of arsenate of lead per given volume of water." It matters not how great an amount of arsenate of lead is used in 100 gallons of water if it is not put in the right place the best results cannot be expected from it. If only three-fourths of the calyx cups are filled during the time of the first spray, it makes no difference how strong the arsenate of lead was used, the remaining one-fourth will probably allow the entrance of enough worms to practically undo all the good that was accomplished by the first spray. It is true also in applying the later sprays that often not nearly all of the apples on a tree will be touched with the liquid, and of many of those that are touched there will be only a small portion of them coated with the spray. The

ORCHARDISTS' SUPPLY CO.

W. M. Grisinger, Manager 301 Newhouse Building, Salt Lake, Utah January 15, 1911.

We offer for spring delivery a splendid stock of standard commercial sorts of one-year apples, peaches, sweet cherries, etc., at wholesale and retail. orchardist meets with a serious difficulty when he attempts to coat any good sized apple with a film of arsenate of lead applied in the form of a spray. Especially is this true of certain varieties, such as Ben Davis, Gano and Jonathan, but the better he succeeds in doing this the better are his chances for success, and there is no excuse in applying these sprays for not exercising the greatest possible care, so that the greatest good may result.

It has been proven that the excessive use of arsenical sprays endangers the lives of our orchard trees, so that certain precautions should be used for their protection. As it is absolutely necessary to use a large amount of liquid to do thorough spraying, precautionary measures should consist principally in the use of the least possible amount of arsenate of lead per given volume of water that will do effective work, and in guarding against needless spraying of the trunks and larger limbs. Two pounds of arsenate of lead mixed with 100 gallons of water has been used with perfect success in many cases, and while it is probable that any of the standard brands will successfully control codling moth when used at that strength, in order to be on the safe side not less than three pounds was advised last season, and the majority of the orchardists used it stronger. Wherever only three pounds were used, and thoroughly applied, the spray proved to be in every way as effective as where the higher strengths were used.

The fact that later sprays must be

applied in a season when codling moth is abundant, and their use can only result in keeping the worms from entering the apples and not in preventing worm-specks, makes it urgent that all methods at the orchardist's disposal be brought into use in the fight against this pest. The question resolves itself, in this valley, into one of decreasing the present abundance of worms, so that less spraying will be necessary. At present we may have to spray often and very carefully, but along with that spraying should go other things that will aid materially in the work.

From the time when apples are picked in the fall until the time when the first moths begin to appear in the spring little attention is given to the matter of codling moth control by the average apple grower. It is, of course, true that codling moth could not be decreased by any method that might be used during this period to such an extent that spraying would not be necessary, but it is also true that work of such a helpful nature can be done that codling moth can be more effectively controlled than by spraying The work during this season, which should not be neglected by any orchardist having codling moths in his orchard, consists in killing all larvae that can be found wintering on the trees or thereabout. In order to do this it is necessary to scrape off with trowel, knife or other instrument all the loose bark which always serves as a hiding place for multitudes of larvae. The larger crotches, cracks, or any other places

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is also the best Harrow for general farming, and for fitting soil for grains, alfalfa, etc., because the coulters work every inch of the soil, cutting through to the under soil, which other harrows leave lumpy and full of air spaces, pulverizes and then compacts this under soil and leaves the top soil loose. Soil harrowed with an "ACME" will attract and conserve all the moisture for the benefit of the growing crops. Made entirely of steel and iron. In sizes to suit every one—3 to 17½ feet wide. Each and every part guaranteed.

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affording shelter, are always favorite places for hibernation. All these should be carefully searched and the larval contents destroyed. The practice of banding trees with burlap before the larvae begin to leave the apples early in the summer and destroying those which gather beneath for pupation every ten days is a valuable one, and particularly so when the trunks of trees have been made smooth by scraping off all loose bark. Bands for this purpose do not need to be made from burlap, but most any kind of cloth with a good nap will answer the purpose. Such bands should

be at least five inches wide and folded so as to make two or three thicknesses of the cloth. The darker it is beneath a band the more liable are the larvae to stay there.

Besides the use of these two methods whereby great good can be accomplished, there is a third one, which is always valuable, and that is the picking off and destruction of wormy apples as they appear early in the season. This can be accomplished along with the thinning operation which most orchardists practice, and which is no doubt of great practical value.

While these three methods are only aids in controlling codling moth, and the use of one or all of them should not be expected to take the place of spraying, still they are too important to neglect when good crops of apples are at stake because of worms. It is safe to say that if every orchardist would cease depending entirely upon spraying and would pay careful attention to these other methods also that the present amount of codling moth could be reduced to the minimum.

♠ ♠ ♠

THE Stark Bros. Nursery and Orchard Company to Thomas Kenny, Sumner, New Mexico: Replying to your favor of the 30th inst. asking for instructions as to the trimming of your apple orchard trees, one year planted, we would suggest that the Stark Year Book will give you considerable information. We can furnish a very good booklet on pruning. There are many such works, but in our judgment, for Western planters particularly one of the safest and best guides right up to date from month to month is the "Better Fruit" magazine of Hood River, Oregon. The December number gives in detail an illustrated article which gives you just the desired information, showing the apple orchard from the time of planting the one-

year tree to the required treatment from year to year tree to the required treatment from year to year up to bearing age, season by season. Editor Shepard is a practical and experienced horticulturist, and as a publisher he is an idealist, and any number of "Better Fruit" is well worth more than the subscription price. Not only does it tell you about orchard pruning, but spraying, grading, the marketing of fruit and all other subjects of kindred interest. We would not only congratulate "Better Fruit" on its great success, but the orchard industry everywhere is a subject of congratulation.

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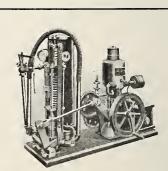
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CONTROL OF THE CODLING MOTH IN CALIFORNIA

BY W. H. VOLCK, HORTICULTURAL COMMISSIONER, WATSONVILLE, CALIFORNIA

HE most important insect pest of the apple is conceded to be the codling moth. An estimated damage of 40% is held by the best authorities to be an average for the entire world. Under California conditions the normal loss due to this insect exceeds even 40%. The warmer interior valleys may easily go as high as 90%, while the coast regions vary from 15% to 60%.

The pear is also much damaged by this insect, with the exception of a few localities along the coast, where, for some reasons not yet fully determined, this fruit is but little attacked.

The value of the apple and pear crop of California would be about \$5.000,000 if all were sound fruit. The total cullage from all causes will average about 20%. This gives a \$4,000,000 market value for the remainder.

Now, if the codling moth were not controlled by spraying an additional 20%

L ILLY'S BEST seed catalogue for 1911 came to our office a few days ago. It has one of the most beautiful cover pages that we have ever seen and is gotten up very attractively in every way. It is full of valuable information about seeds for vegetables and flowers. This catalogue will be sent on request to Chas. H. Lilly, Seattle, Washington.

of loss would have to be added, which is \$1,000,000. To save this \$1,000,000 California orchardists use about \$25,000 worth of arsenate of lead, and it costs something like \$30,000 to put it on the trees. This makes the total cost of spraying for the codling moth some \$55,000.

Then it is evident that the rather large sum of \$945,000 is saved to the growers of the state by the use of arsenical sprays. This is a very good showing, but the loss from worms is still too high. The saving of an additional 10% of the fruit would mean the increase of the profits to be about \$500,000.

The codling moth problem, from the farmers' standpoint, cannot be regarded as satisfactorily solved until he is able to save this additional \$500,000.

A practical entomologist could take any apple or pear orchard in the state and reduce the worm loss to less than 3%. This reduction in worms would be accompanied by the lessening of the total number of culls from other causes. for insects other than the codling moth are frequently responsible for these

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For sale, splendid 95-acre 6-year-old apple orchard, Grande Ronde Valley, one-half mile from town on railroad. No better soil or fruit district in Oregon. Orchard of Rome Beauty, Yellow Newtown, York Imperial and Gano trees, which are in fine condition; no insect pests. Price \$50,000, and can be practically paid for from the crops grown on orchard. There is a fortune here for the right man. This is no wildcat fruit venture, but a solid business proposition that on a very conservative estimate will double in value inside of five years. Future absence from state makes sale necessary.

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Choice ten-acre tracts Okanogan fruit land. First-class upper bench, near government canal; 1,280 feet altitude. Well water in gravel, thirty feet, pure. Planted to yearling apple trees; best red winter commercial varieties; also tracts not planted. Ready to irrigate. Great Northern Railroad now building in Okanogan Valley. Prices and terms right.

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Some choice tracts in one to three-year-old orchard.

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culls, and are largely controlled with arsenate of lead.

It would cost more to spray an orchard in such a manner as to insure complete control of the worms, but the proportionate increase in cost would certainly be less than the value of the advantage gained.

It is unfortunate that our fruit growers are not all practical entomologists, and capable of doing this kind of work. Even if the fruit growers were willing to follow closely and conscientiously the advice of standard authorities the situation would be much improved.

The codling moth problem has been before the apple and pear growers so long that practically every man has his own ideas on the subject of the best methods for control. This makes it difficult to cause the great majority of the growers to follow instructions closely.

The problem of codling moth control cannot, then, be considered solved until a means is found whereby the growers can be induced to accept a uniform and effective method of spraying.

Entomologists are spending considerable time on the codling moth problem. largely with this end in view. The progress in recent years has been great, and the results have been correspondingly improved. These studies of the codling moth problem have embraced a very wide range of subjects.

The practical entomological side of the question consisted in working out the life history of the insect. This has now been done in many localities, and when the average results are compared it should give a very accurate knowledge of this feature of the problem. The codling moth is largely influenced by climatic conditions, and prefers warm weather; that is, the greatest developments take place in the warmer sections of the country. As the temperature increases the rate of growth of the insect also becomes more rapid.

The most important facts in the history are that the winter season is passed by the adult larvae in their cocoon. With the approach of spring the larvae transforms into pupae. The pupae stage is rather short, being from ten to fifteen days, when the adult moths emerge.

This part of the life history was comparatively easy to work out, and has long been well understood. What the moth did after emerging was not so easy to determine, and many erroneous ideas have prevailed with regard to the adult stage of the insect.

It was long supposed that the moths proceeded at once to lay eggs in the calyx cup of the apple. This was the

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prevailing notion up till the beginning of the present decade.

In fact the eggs are probably never laid in the calyx cup, and seldom, if ever, upon the young apples at any other point. The character of the codling moth egg is such that it requires a very smooth surface upon which to be deposited.

In the early spring about the only smooth surface is the upper side of the young leaves. Then the majority of the early eggs are necessarily laid on the leaves. As the season advances the under surface of the foliage becomes suitable for egg laying.

About this time the hairs disappear from the rind of the fruit, and we begin to find codling moth eggs on the apples.

These eggs hatch in from eight to fifteen days, according to climatic conditions, and the young worms begin to

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feed in a short time after hatching. It was long supposed that the codling worms are nothing but the pulp of the apple or the seeds.

Recently it has been learned that the foliage and other portions of the tree may be attacked by the young worms before they have started into the apple. Unquestionably the codling worm seeks the apple as the most suitable food for its development.

The instinct to hunt protection is also strong, and the young worms apparently desire to get out of sight as soon as possible. The calyx cup of the apple offers quite thorough protection, which is probably the reason why a large percentage of the first generation of worms enter the fruit at this point.

Under some climatic conditions this tendency to enter the calyx cup is so pronounced as to have led the earlier observers to believe that the egg was laid in the blossom. The tendency to enter at the calyx varies considerably with the locality. In some sections it is as high as 80%.

The coast districts of California are examples of localities where the calyx cup entries are likely to be less numerous, while the interior districts usually show the largest perecentage of entries at the blossom end.

If the young worms do not enter at the calyx they usually go in between two apples, or at the point where a leaf is in close contact with the fruit.

After penetrating the fruit rind the young worms feed just underneath the surface for a few days, and then start a more or less direct burrow to the core. The feeding in the vicinity of the core frequently results in cutting off the sapconducting vessels of the fruit, and so stopping its development. For this reason the fruit that has become wormy early in the season usually falls in July or August.

The time required for the development of the codling moth larvae varies according to the prevailing temperature, and may be as short as fifteen days or as long as thirty to thirty-five days. The climatic conditions of Pajaro Valley are such that the long period of development is much more frequent than the shorter.

When the worms have matured they leave the apple and seek a suitable place in which to transform into adult insects. Many will be found located under the rough bark of the trees, and any other protection near the tree trunk.

A strip of cloth tied around the trunk will frequently catch a number of worms. This fact was noted by some of the early observers, and was supposed to offer a means of controlling the insect, but the most careful watching of these bands failed to materially lessen the loss from worms. This was found to be due to the fact that only a portion of the moths were caught in this way.

The larvae of the first generation do not remain in the cocoons, but soon transform into adult insects, the period requiring from ten to fifteen days. The moths which emerge are known as moths of the second generation. They

lay eggs in much the same manner as the first generation moths, but as the fruit rind is thoroughly smooth, practically all the eggs are deposited on the apples.

Curiously, second generation worms are not so particular about seeking pro-

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tection as those of the first brood, and we find them entering the apple in exposed as well as protected places. The worms of the second generation require about the same time to develop as those of the first.

Second generation worms practically all have the wintering-over instinct, so they seek well protected places after emerging from the fruit, and there remain until the following spring.

The facts in this life history have been utilized by entomologists to determine the correct method of applying sprays. As a large number of the first generation worms enter at the blossom end it is apparent that a deposit of poison at this point should be very effective. In order to get spray material into the calyx cup it is necessary to do the spraying before the cup closes.

The ideal time for this spraying is now conceded to be when about 80% of the blossoms have fallen. If the calyx cup spraying is not applied it is then necessary to protect the outer surface of the fruit, and also the foliage, at a time

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The spraying methods of the various localities will vary according to the regularity with which the moths develop; that is, if the insects all emerge and lay eggs at about the same time it is possible to control them with one application, but if this emergence is drawn out through a considerable period some extra sprayings will be necessary.

The coast districts of California offer an example of the long drawn out emergence of the first brood. The calyx cups of the apple close about the middle of April, but the first worms may not appear until May is well advanced, and usually there is a considerable hatching in the early part of June.

During this period the fruit is growing rapidly, so as to require more than one

spraying to protect it.

In these localities the second brood worms are also irregular in their appearance. The attack commences in August and advances in October. In some localities the calyx cup spraying, if properly applied, is surprisingly effective, and in certain cases has proved all that is required for the control.

Under average California conditions the calyx cup spraying is an important factor, but does not effect the complete control, for the reason that too many

worms enter at other places.

In order to make use of the facts in the life history of the codling moth it was necessary to have a suitable poison or spray material. The chemical side of the problem is then quite as important as the entomological. Especially is this true in any locality where the trees are likely to be injured by spraying.

The discovery that arsenic would poison codling worms, and so reduce the number of wormy apples was made many years ago. Paris green soon came into favor because it was found to be less injurious than white arsenic, and for many years this material was the standard spray for the codling moth.

Paris green was regarded by chemists as insoluble in water, and, therefore, could not injure the foliage when sufficiently pure, but it later developed that injury took place, under certain conditions, even with the very purest samples.

This was especially true in the Pajaro Valley, and so serious were the results of spraying for the codling moth that the apple growers had begun to fear that the worms could not be controlled. It was very apparent that the problem of spraying under the climatic conditions of the Pacific Coast had to be carefully studied.

The investigation of this problem was undertaken by the University of California in 1903, and has been continued up to the present time. Paris green was soon discarded as entirely unsuitable, and the remainder of the investigation has been directed to the study of arsenate of lead. This compound of arsenic is very much more stable and insoluble than any other known.

The solubility of arsenate of lead in water was considered so low that it would never cause any injury, but the climatic conditions of the Pajaro Valley soon demonstrated this conclusion to be erroneous, and it was found that great injury might result from spraying with this newer insecticide, but the fact that certain lots of arsenate of lead which came to hand did no injury encouraged us to believe that the difficulty might be controlled. This was done after a very exhaustive investigation of arsenate of lead and other arsenicals.

The trouble was found to lie in the fact that several compounds might be formed when arsenic acid and lead oxide are combined. The only one of these compounds which meets the requirements—that is, sufficient insolubility in water—is the ortho compound. Two other arsenates exist, and are likely to occur in arsenates of lead. These are the pyro and meta compounds.

Arsenate of lead has now become the standard arsenical, and a considerable number of commercial brands are in use at the present time. These brands are almost exclusively either mixtures of

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ortho or pyro or contain straight pyro. Notwithstanding this fact arsenate of lead is generally considered a safe spray, and very little complaint is heard regarding foliage injury over most of the United States.

These facts may cause people who are not acquainted with the conditions prevailing on the Pacific Coast, and especially in the Pajaro Valley, to fail to appreciate the exact requirements of the case. Also, it is not surprising that chemists and entomologists in general have been satisfied with a very incomplete knowledge of the chemistry of arsenate of lead.

The local conditions in the Pajaro Valley made it imperative to study this problem, with the resulting important additions to our knowledge of spray materials. These climatic conditions which have been referred to consist in the great abundance of wet fogs and dews, which occur almost every night. The foliage becomes thoroughly wet, but does not always drip, and a great many of the leaves retain the water until it dries up during the day.

This is just the ideal condition for the gradual solution and absorption of the arsenic. If the arsenical is soluble in water and affected by weathering, then the repeated and long continued action of small amounts of water would give the maximum effect. Any injuries in the surface of the leaf admits the fog water to the internal tissue. This water carries with it any substance which it may hold in solution.

If the arsenic in the spray deposits is being dissolved the time soon arrives when enough is introduced into the leaves to cause injury. The tissue begins to die around the points where the fog water gains entrance to the leaves, and these spots gradually enlarge until they may cover the greater portion of the leaf.

Before this time arrives many of the leaves turn yellow and fall. The falling of the leaves frequently occurs much in advance of the normal autumn shedding, and with bad cases of arsenical injury the trees are frequently quite bare by the end of August. The early loss of the foliage prevents the proper maturing of the fruit, with resultant small and comparatively worthless apples.

The arsenic also penetrates into the wood tissue, probably being carried by the sap vessels from the leaves. The amount which enters the wood is too small to cause the death of the tissue, but it greatly impairs the general vigor of the tree.

The early falling and killing of the leaves results in poor general nutrition conditions, which in itself causes profound disturbances of the normal growth for at least two years in the worst cases.

Anyone is able to appreciate the fact that these bad cases of arsenical injury must be avoided. On the other hand, we find very few orchardists, or even authorities, prepared to admit that slight injuries, such as may occur in the drier sections, may be worth considering.

It is my opinion that the experience of the Pajaro Valley is a very timely warning to the entire apple producing area of the country, for it must be conceded that a material which does marked injury under the coast conditions will have more tendency to injure elsewhere than one which is harmless in the most trying circumstances. The orchards of the Pajaro Valley may then be taken as a sort of indicator to judge what a correct spray material should be.

What the ultimate effects of applying arsenicals which may produce injury will be no one can now say. Under the circumstances it certainly would be the wisest thing to take no unnecessary chances.

If the codling worm can be controlled satisfactorily with the ortho-arsenate of lead, then that arsenate should be used in preference to any other kind. The control of the codling moth with the very insoluble ortho compound has been demonstrated, not only for the Pacific Coast districts, but in many other parts of the country.

Perhaps there would never have been any agitation in Colorado had all the arsenicals applied been in the form of ortho arsenate of lead.

With a correct spray material and a precise knowledge of the life history of the codling moth, it should be possible to outline a thoroughly satisfactory spray program. This will differ for the various localities in the country, but it may roughly be outlined as follows: Spray very thoroughly just before all the blossoms have fallen, endeavoring to force

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the material into the calyx cups. For this application use ortho arsenate at the rate of six pounds to 100 gallons. This estimate being based on the usual form of the commercial lead—that is, 50%

This application will occur some time in April for the majority of the Pacific Coast sections, and should protect the apples from those worms which endeavor to enter at the calyx.

A second application about the middle of May will protect the outside of the fruit at the time when the first codling moths are beginning to appear. This application should be very thorough, but the quantity of arsenate of lead may be reduced to four pounds to 100 gallons.

A third spraying for the first brood will do no harm, and should be applied in the early part of June, using the same strength as for the second.

If these applications have been sufficiently thorough the second brood may be so small as to require no spraying.

The orchardist can determine this by looking for wormy apples on the ground in July and the early part of August. If very few can be found it indicates that the first brood worms have been well controlled. A sufficient control to eliminate the second brood spraying would be the case where not more than two or three wormy apples could be found per

The average grower will not get results which warrant him in neglecting the second brood spraying. Usually one application will suffice, and that should

be made early in August, but not in July, except in the warmer valleys, where the codling moth emerges earlier. The same strength of material and method of application as is recommended for the other sprayings should be followed.

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In the Pajaro Valley and adjoining localities I find that the most prevalent cause of failure to secure the best control is due to the neglect of the August

The orchardists and apple buyers are largely influenced by the fear of knocking of fruit with spray rods and the spray outfit. A little reflection should convince them that it would require special effort on the part of the men to dislodge 2% of the fruit. Then, if this application would save 10% from the worms, the loss of the small quantity which would occur when ordinary care was used is

entirely negligible.

Practical entomologists and horticulturists have still another phase of the problem to consider. This arises from the fact that the codling moth is not the only pest of apples and pears. Several other insects and diseases are causes of considerable damage, and frequently some one of these may be more destructive than the apple worm. Then the control of the worms alone may not bring the saving necessary to financial success, or produce first-class fruit. Other remedies than arsenate of lead are required for the control of some of these pests. but to make a separate application to correct every disorder would require a far too elaborate spraying program, and greatly increase the expense. If possible, these various remedies should be combined in a single application, and the problem of preparing this combined

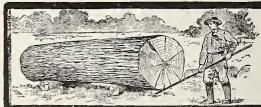
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spray is the most exacting and important of any now facing the entomologist and plant pathologist.

The problem is one involving insect pests, plant diseases and the chemistry of insecticides and fungicides. Also, the physiological effects of spray materials and other treatments of the trees enters as a very important factor. The delicate nature of this last phase of the problem is usually underestimated, but the conditions of the Pajaro Valley are such that the investigator is frequently and forcefully reminded of its importance. Owing to this fact and the urgent need for sprays which will do the work in this locality, it is quite probable that much valuable research work will be done here, and the whole science of plant pest control considerably advanced. Already much has been accomplished by the investigations conducted in the Pajaro Valley, and several investigators have contributed to these results.

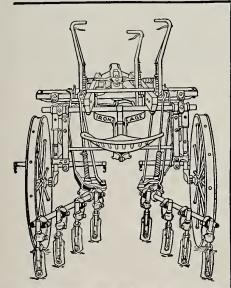
The most important results of the local investigations are the determination of the properties of lead-ortho-arsenate and the invention of a process of manufacture to produce this compound cheaply, and with certainty. The iron sulphide spray for the apple mildew is also an important advance in the knowledge of fungicides, and the use of this spray in combination with arsenate of lead has given good results in the control of worms and mildew. Again, iron sulphide, arsenate of lead and nicotine may be combined, giving an effective spray for aphis as well as the other two pests mentioned. These examples are cited to indicate the lines along which the most profitable investigations of the future may be safely directed.

The local field is a very extensive one, and the needs of the apple industry are most pressing. There is work for many investigators, and all who desire to work here are more than welcome.

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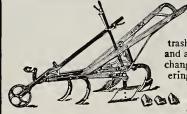
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FROM ORCHARD TO DEPOT BY AUTO.—
On a certain night last summer if a visitor to Chicago had been in a hurry to get to the North Side on a North State or a North Clark Street surface car he would have had to take the Elevated road.

For two hours and a half the writer watched a tie-up on all North Side surface cars caused by the fact that a trainload of peaches or some other perishable fruit had arrived in town Saturday evening too late to be marketed. It was heing sold at "cut-throat" prices because it was feared that the fruit would have been worth nothing at all the following Monday morning. Hundreds of struggling women were there buying their winter preserves; hundreds of pack peddlers were struggling to fill their baskets for distribution that evening, and scores of Greek wagon fruit venders were gathered along the entire length of South Water Street, shoving, pushing and scrambling in their effort to get something almost for nothing. It was a view of bustling city life worth going to see, but so common along that street that no attention was paid to it except by those whose movements were hindered hy the congestion of traffic.

Whether the farmer who grew that fruit got a fair price for it and the Chicago merchant lost, or whether it was shipped on consignment and the burden of the sacrifice fell upon the farmer, the writer does not know. But it looks to him that if transportation had been just a little swifter and the train bearing that fruit had reached the city early Saturday evening, both the merchant and the grower would have realized fair profits.

This is just one of the incidents which show how completely transportation can make or break a fruit grower.

To a great many people on the farm transportation from the point

This is just one of the incidents which show how completely transportation can make or break a fruit grower.

To a great many people on the farm transportation from the point of view of speed does not begin until the fruit reaches the depot. The possibility of an earlier train, or of making valuable connections, is often overlooked because of the inability to make any better time between the farm and the freight shed. To the more modern, however, that is to those who are quickest to grasp each new invention as if it were made especially for their convenience, the race against time begins at the berry patch or at the orchard. In this race, as in most other races against time, Old Dobbin is not one of the entries. His place has been taken by the motordriven vehicle. The long-drawn battle hetween gasoline and oats which has been waged in the cities has spread to the country, and in the last few years the high-wheeled auto delivery wagon of the metropolitan grocer and the

The writer, as a boy in a fruit-growing country, remembers many a pleasant evening drive to town after a busy day in the field, but he also remembers that he was never allowed to use the horse which had worked all day; and if he went for a drive on Sunday he was forbidden to take the horse which had worked all week. In those days, before auto buggies appeared on the farms, we went to the village, two miles away, on week nights, and to the city, twelve miles away, on Saturdays. This last was a big trip, something like going abroad. Nowadays, in that same region, farmers deliver a load of fresh vegetables or freshly picked fruit to that same city with their auto wagons, and are back to their farms before the regular day's work begins. During the day it is not an uncommon thing to take a pleasant spin to the city, do a little shopping, pay a few calls and get a little excitement—all on the same power.

The writer, as a boy in a fruit-

car which made the early morning marketing trip with the fruit and produce. And then, again, in the evening a short trip is frequently made by the younger members of the family. Formerly one trip with a horse and buggy meant twenty-four hours for the horse, which was considered a good day's work.

The opportunity which the possession of such a car opens to the farmer's family for a social life is revolutionizing the attitude of the farmer family toward living on the farm. It is doing more than the rural telephone to drive away the loneliness and the discontent which has always been a part of the socially inclined woman's life on a secluded farm.

Of course, the horse was a dual purpose means of transportation, useful in both business and pleasure, as every farmer's son knows, but it had its limitations. It required a lot of care, it must be carefully fed and housed, it is not clean to handle after you are all dressed up and it has to be "put up" at night. Then there are certain

weather conditions when it is cruel to take a horse out at all. On the other hand, with an auto delivery wagon, whether you put the back seat on and take the family to a party or whether you take an hour off to make a quick delivery to some early train of a half ton of fruit, the question of weather does not enter into this. The fear of overwork never arises, there is no morning feed, no stables to clean and no harness to put on. It needs no argument to show that the commercial car, as a matter of convenience, has the advantage. In regard to speed the conditions are the same. The average high-wheeled auto wagon will make from fifteen to twenty miles an hour. It will climb any hill and bad roads do not have to be considered at all. Last winter, in Chicago, all Michigan Avenue smiled when one hlizzardy day one of these cars was kept busy towing expensive, high class pleasure cars and roadsters, that were unable to make any headway against the storm.

Fruit growers who have suffered through delay or through missed trains are keen to take up the

or through missed trains are keen to take up the

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is strong, substantial, and lasting, and fully guaranteed. has low wheels enclosed by a steel frame, with steel tongue. Carries cultivator teeth sweeps, hoes, and furrowers, and is equipped with side-hitch and fruit and tree shield. Adjustable for depth and width of cut. Easily handled.

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Most wonderful invention of the

Most wonderful invention of the age, and the fruit grower and vegetable producer reap the benefits.

The "Draw the cover and regulate the fire" principle has won, and we offer you the very best your money can buy, with absolute protection to your crops. A quarter of a million heaters in the hands of inexperienced heaters in the hands of inexperienced growers last spring has proven every claim we have made. Get in line with other progressive growers and protect your crops from frost. Write us today for full information and for the story of "Frost Fighting," which will interest you.

The Hamilton Reservoir Orchard Heater Co.

Grand Junction, Colora -o

pelling the orchardists to protect their crops against frost and forced each man to give his services in case of danger. This law was worked out on very much the same system that frost fighting in the Grand Valley is today. Throughout this long career of frost fighting, there is not a single record showing the use of large fires, which substantiates the theory that there is no need for great heat locally, but there is need of numerous small fires well distributed.

These old records would have little value, however, if it was not for their substantiating the theory that modern science has followed. Every scientific principle of ancient or modern origin supports the theory that to get the best results from a certain amount of heat, the same must be thoroughly distributed.

The government in all of its reports on smudging or orchard heating makes a strong point of small fires and warns the growers aganist the use of large fires (see Farmers' Bulletin No. 104 and Year Book, Department of Agriculture, 1909, page 360). Furthermore, the majority of practical orchardists who have tested the various methods for themselves will agree with me that the best results were obtained with small fires.

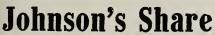
Large fires have the same effect that old-fashioned hearth fires have—your face is scorched while your back freezes.

When furnaces were most generally used in large houses or buildings almost invariably two furnaces would be used, as it was found that two furnaces of smaller type would give more heat from a ton of coal than one large furnace.

Steam heating follows the same principle; numerous small coils are scattered around or throughout the building, church or auditorium, as such coils heat the building much more evenly than half the number of coils would, double the size.

When it comes to out-of-door heating this principle becomes all the more important, as the air drafts are stronger.

Heat rises, and when the fires in an orchard are placed too far apart there is no time for the heat waves to meet under the blossoming trees



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IT WORKS. To the right is illustrated a spring of water; on the left hand corner is privated a creat section view of a PHILLIP's left hand a creat section view of a PHILLIP's LAULE RMA. The little hand is connected to the Ram. The water brough the pipe doerward to the natraces of the trans. Notice that is connected to the Ram. The water was the first the property of the connection of the connection. As a list acred to a value that raises as the water game in momentum, after eaters the ram and as it cannot go past 4 it gusbes through a The little arrows illustrate the water watering out. It comes to a connection of the connection of th

For information as to size of Ram you require, and price, write a letter explain-ing how much water fall you have, and other information, to

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before the air currents carry the heat into the upper strata.

Years of experience have proved that forty square inches of fire area in one place is as large a fire as should ever be used. The forty square inch opening has come to be known as the "Standard" opening. Experience has also shown that for each degree of rise in temperature 400 square inches of fire area per acre are necessary on the average. This will vary, of course. High winds will make necessary greater heat, while on very still nights often half of this amount will accomplish the same purpose.

At this average it will require four thousand inches of fire area per acre to raise the temperature ten degrees.

At this average it will require four thousand inches of fire area per acre to raise the temperature ten degrees.

With the standard opening for each heater, it will require one hundred heaters to accomplish this result. It will take an opening of eighty square inches of fire area per heater if only fifty heaters are used. This is my reason for condemning large fires.

Large receptacles are more expensive, and the grower seldom is willing to purchase a large heater if it is going to cost him double as much, and, therefore, he compromises by using only half enough of the large heaters. We orchard heater manufacturers are to blame for this, however, for we assure our customers that half as many large heaters are just as efficient, in spite of the enormous number of scientific facts that prove we are wrong. The growers take our word for it, and they are the ones who suffer.

My objections to large fires are principally the fact that large fires create a strong draft, which carries the heat far up into the air and causes the cold drafts to rush in from the sides to take its place, and that large fires do not heat evenly. In one place the heat will be great enough to scorch the trees, while half way between the fires Jack Frost will probably be getting in his work. This is always the same unless twice as much heat is being produced as is necessary.

Large receptacles are nice, and I recommend them for the grower who is willing to use them

heat is being produced as is necessary.

Large receptacles are nice, and I recommend them for the grower who is willing to use them as a reservoir to save refilling so often. This is the only excuse for the existence of a large heater, and it should be borne in mind that just as soon as a large receptacle is used for the purpose of creating more heat a greater quantity of fuel will be consumed, and the heater will have to be refilled just as often as if it were a small heater.

So strongly do I feel upon this subject that I would rather see the growers use a common lard pail, which is patented by no one, using 150 of them to the acre, than have them use only 50 of our No. 3, or some other reservoir heater, for

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The Wood Waste Distilleries Company, Inc. Wheeling, West Virginia, U.S.A.

Denatured Alcohol in Solid Form

Cleveland Special Dispatch — September — A wellknown Wheeling, West Virginia, chemist has succeeded in producing chunks of denatured alcohol in crystal form, by means of a small infusion of certain acids, very closely resembling physiologically the effects of ethyl alcohol distilled from sawdust. The method employed and the results obtained are somewhat similar to the crystallizing of rock candy or that of saccharine, containing as it does 350 times the sweetening strength of cane sugar, so this alkaloidal crystallized alcohol contains many times the strength of the ordinary denatured fluid alcohol. They will yield 194-proof denatured alcohol, with a greater heating and cooking power for stoves than gasoline, and it is absolutely non-explosive.

A sample can containing 50 solid cubes, a stove and the secret formula showing how simple it can be made at home, will be mailed to you, postpaid, on receipt of \$5.00, or express C. O. D. Address

The Wood Waste Distilleries Co.

INCORPORATED DEPARTMENT H

Wheeling, West Virginia, U.S.A.

rarely will a season pass without the need for greater heat than can be obtained from fifty heaters with the standard opening. It would be better to use three times as many little heaters, well distributed, lighting them as they are required, than to increase the heat by opening the fifty reservoir heaters to the intermediate or reservoir opening, and the cost of equipment will be less. Some people say that the heaters will be in the way, and that the fewer used to the acre the better. This is not so. Large fires have to be placed in the open, away from the trees, which places them in the way of hauling, spraying, plowing etc.. while small fires can be placed in the tree rows, and out of the way of any orchard work. I have used both in my orchards, and know how they work.

Orchard heating is no longer an experiment, but has become one of the most important branches of orchard work. There are thousands to testify as to its great protection. We all know of the great need for the same in all sections; therefore these subjects are not as important, but the ways and means of obtaining the best protection with the least cost is of vital importance, and merits a thorough discussion and the closest investigation.—P. H. Troutman, President The Round Crest Canning Company, Canon City, Colorado, at meeting of Colorado State Board of Horticulture.

 \diamond \diamond \diamond

A MASS MEETING of the fruit growers of Goodnoe Hills and Sundale was held on January 2nd for the purpose of forming an organization of fruit growers of these two districts. The meeting was called by notice posted at the Goodnoe Hills postoffice. At 2 o'clock in the afternoon the meeting was called to order. Professor L. I. Hewes was elected chairman of the meeting and L. M. Baker secretary. Messrs. Shepard and Elwick proposed a program, which was read by the secretary, and considered section by section. Remarks on windbreaks, orchard cultivation and orchard pests were made by Messrs. J. R. Shepard, W. A. Rice, W. D. Challacombe and William Elwick. Transportation facilities were considered, and remarks on this subject were made by Professor L. I. Hewes of Whitman College.

The poor telephone service in the Goodnoe Hills and the lack of any in Sundale was a subject thoroughly gone over at the meeting. On the motion of Mr. Lincoln Heriot the meeting was adjourned until the second Saturday in February.—L. M. Baker, secretary.

♦ ♦ ♦

Owing to a slight error in the article on "Effect of Freezing on Buds, Bloom and Fruit," published in the December issue, the temperatures given relative to injury to buds during early winter should have read: "In early winter a temperature of 10 degrees below zero is seldom injurious to peach, apricot, sweet cherry or plum buds, but at 15 degrees below zero injury may result, and that perfectly dormant sour cherry and some of our native plum huds are not injured by temperatures as low as 40 degrees below zero."



up, but the increase in price in pure white lead paint is not so great as you may fear.

Get at your dealer's the cost of 100 pounds of "Dutch Boy Painter" White Lcad, 4 gals. pure linseed oil, 1 gal. tur-

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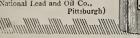
Compare this cost, either by the gallon or by the job, with what you used to pay for paint. You'll find the difference so small that you can't afford to put off painting, or to paint with anything except "Dutch Boy Painter" White Lead. Write for free "Painting Helps No. 130

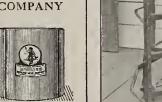
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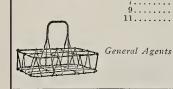
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This is our second experience in carrying off Gold Medal given by National Horticultural Congress for best power sprayer.

The Cushman has carried off highest honors and diploma at every state fair where shown, and never has taken second place in any contest since the first machine went into the apple orchard in 1902.

A few of the reasons why the Cushman scored 74 points better than the next best outfit and more than 150 points better than some of them:

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construction was found to be superior.

2d. The samples of spray mixture taken from various parts of tank demonstrated that our agitator did the most thorough work. It is also simplest in construction, having no gears.

3d. Every machine was weighed by the judges when empty and again when filled with liquid. Our tank carried 40 gallons more mixture than did any other machine, and yet the draft on team was 32% lighter, as measured by traction dynamometer.

4th. It is best suited for hillsides because the weight is low down and the Schebler carburretor delivers exactly the same mixture to engine on hillsides as on level land.

5th. Our tank was found to be the strongest in construction, lightest in weight and largest capacity.

capacity.
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1909—Tronson & Guthrie, Eagle Point, Oregon. 1910—C. H. Sproat, Hood River, Oregon. All sprayed with Grasselli Arsenate of Lead.

Bear in mind that this material was used at three different points, and during three different seasons. Does this not demonstrate to your satisfaction the superiority of Grasselli Arsenate of Lead, both as to locality and climate in which it may be used?

If so, it will not be necessary to ask yourself the question, "What Arsenate of Lead shall I use this season?" You will order Grasselli Brand.

Do not buy Arsenate of Lead on arsenic contents alone. Bear in mind when buying this spray that lead should be given equal consideration with arsenic, because it increases the adhesive properties and reduces to a minimum foliage injury.

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And in all consuming districts

Write the above, or

H. N. LYON, Northwestern Representative 505 Concord Building, Portland, Oregon, for name of nearest distributor

THE GRASSELLI CHEMICAL CO. Established 1839

Main Office, Cleveland, Ohio

St. Paul, Minn. Chicago, Ill., 2235 Union Court New York City, 60 Wall Street St. Louis, Mo., 112 Ferry Street

New Orleans, La. Cincinnati, Ohio Birmingham, Ala. Detroit, Mich.

AS LONG AS YOU'RE GOING TO BUY A POWER SPRAYER, YOU'D BETTER GET THE BEST—A CHAMPION



COSTS NO MORE TO BUY THAN ORDINARY OUTFITS AND COSTS A LOT LESS TO OPERATE

- YOU COULDN'T DO WORSE than to buy a poor sprayeryou'll pay for it twice over in time lost, solution wasted, and repair bills.
- OF COURSE IF YOU HAD TO PAY MORE for the best sprayer - which is the Champion - then there might be some reason in saving money and taking a chance.
- BUT THAT ISN'T THE CASE—the Champion costs actually less than inferior power sprayers of other makes. One reason is, the Champion is simpler, therefore costs less to build and so can be sold for less. Then, too, we make them in large quantities—being the largest exclusive manufacturers of power sprayers in the world, and we give you the benefit of the saving we effect in that way.
- THE SAME SIMPLICITY OF DESIGN that enables us to make and sell the best sprayer for the price of an ordinary one also makes the Champion the easiest to operate and the most economical.
- SO THERE'S ONLY ONE REASON why anyone would buy any other power sprayer—he hasn't seen a Champion in operation nor investigated its many superior features.
- YOU OWE IT TO YOURSELF to get our catalog, study the technical description of this splendid outfit and let us send you the names of prominent orchardists everywhere who are using Champions. The rest will be easy.
- PLEASE REMEMBER THIS—we are specialists. The Champion Manufacturing Company manufactures only power sprayers. We never have made water pumps nor farm machinery. Sprayers are not a side line with us.
- WE DEVOTE ALL OUR ENERGIES to making the best power sprayer possible—one that solves all problems in the handling of all kinds of solutions, and does it more easily, quickly and economically.
- ORDERS ALWAYS AHEAD OF SUPPLY. So send for catalog at once, then order quickly, so as not to suffer delay in delivery. Champion Automatic Power Sprayers are fully guaranteed.
- DO YOU KNOW the Champion nozzle—the only variable one—does away with towers; sprays the highest branches, or lowest, from the ground; from any point regardless of direction of wind; does a perfect job-and saves half the solution. Look into it.



Department D

PONTIAC, MICHIGAN

W E have just received an advance copy of the January edition of the Fruit Grower, which contains much interesting and valuable information about spraying and other subjects in general. The Fruit Grower is one of the oldest horticultural papers, and has a very large circulation. This edition contains 88 pages, with colored cover, and is very attractively gotten up, and contains

very interesting and valuable information for the fruit grower. The Fruit Grower was originally called the Western Fruit Grower, and by many is still spoken of in this way. A large part of this edition has been given to horticultural interests, with departments on beautifying of the home house building, a column for home folks, poultry gossip, and so forth. We presume that the Fruit

Intensive CULTIDATION Grower is extending its field, and will be more general in the future than it has been in the past. This inference is made from the fact that on their letter head is the following paragraph: "Illustrated monthly magazine for progressive American farmers." The Fruit Grower is edited by James M. Irving, with W. G. Campbell as general manager. The Fruit Grower is well worth the subscription price of \$1 per year, and our opinion is that the orchardist takes too few papers instead of too many.

BEES AND FRUIT-GROWING.—The value of bees in the pollenation of fruit blossoms is becoming better known each year. Anyone familiar with the growing of fruit and also in touch with the bees as pollenators would not dispute the great help that bees are in the production of a generous crop of fruit. Fruit-growing and beekeeping are two industries that combine very nicely. The American Bee Journal, now in its fifty-first year, is not only the oldest bee paper in America, but its contents each month are the very best that can be had in its field. It is publisher year, the first of the first year, is not only first year, is not publishers also are headquarters for everything in the bee literature line. Our readers should be interested in the keeping of bees, not alone on account of the excellent food product produced, but in order that they may have the benefit of the work of the bees in pollenating fruit blossoms. In order that you may know just what the American Bee Journal is, we would suggest that you send for a free sample copy to its publishers.

The American Well Works requests us to make the announcement that they use the Westinghouse pump for the reason that they have received best results, all things being considered, by using Westinghouse motors.



TOOL that SAVES

What Prof.
Bailey Says

"The Double Action 'Cuaway'
Harrow has been satisfactory. I use it almost continuously on our hard clay land with good results."

Why buy two tools when one will do two kinds of work and do it better and easier? Clark's signal 'Cutaway' Harrow can be used as a field harrow and its extension head frame converts it into an orehard harrow. Drawn by two medium horses and will cut 28 to 30 acres or double cut 15 acres in a day. The genuine "Cutaway" disks, stirs, lifts, twists and aerates the soil. Working the soil this way lets in the air, sunshine and new life and kills foul vegetation. Thorough cultivation makes large crops. Successful farmers, orchardists, garden'rs and planters know that intensive cultivation is profitable when done properly. Clark's "Cutaway" tools

Our disks are made of cutlery steel shaped and sharpendi nour own shops force Why buy two tools when one will do two kinds

made of cutlery steel shaped and sharpencd in our own shops and are the only genuine "Cutaway" disks.

Beware of imitations and infringements. We make A tool for every crop. If your dealer can't supply the gennine "Cutaway," write us your needs. Satisfaction guaranted. Prompt shipments. Send a postal today for our new catalogue "Intersive Cultivation." It's Free.

Labor Original "Cutaway"

CUTAWAY HARROW CO., 940 MAIN STREET, HIGGANUM. CONN. Mitchell, Lewis & Staver Co., Western Agents, Portland, Oregon

The FAMOUS REX SPRA

REX LIME AND SULPHUR SOLUTION, the original concentrated preparation for spraying fruit trees and for animal dip.

This article has been on the market for some eight years and wherever used throughout the United States has given universal satisfaction. It has always been recognized as the highest standard of commercial solution. Because some of our imitators have succeeded in making a concoction that gives a fair Beaume test is by no means a sign that they have the merit that Rex has. We quote the following from the Michigan Experiment Station, Chemical Division: East Lansing, Michigan, June 8, 1910.

Total sulphur ...
Total lime (CaO)
Sediment
Beaume

This proves that the analyses of this state official bulletin shows that Rex will stand from 10 to 60 per cent greater dilution than any of these brands, and shows that the directions for Rex are right and that every one of the others is wrong. This also shows that Rex at the same price per barrel is from 10 to 60 per cent cheaper than the others.

REX ARSENATE OF LEAD

We are also prepared to furnish our customers with the highest grade of Pyro and Ortho Arsenate of Lead, having the following guaranteed analysis:

Over 15 per cent arsenic oxide; not more than 50 per cent moisture, and less than one-half of 1 per cent soluble arsenic. The facts are, that Rex Arsenate of Lead averages over 16½ per cent arsenic oxide and less than one-quarter of 1 per cent soluble arsenic. So you see that this is far better than what is required in the federal insecticide law.

FOR INFORMATION AND PARTICULARS ADDRESS:

California Rex Spray Company Benicia, California

Yakima Rex Spray Company North Yakima, Washington

Wenatchee Rex Spray Company Wenatchee, Washington

TELEPHONE

THE telephone is primarily for business. All fruit growers have more or less business to transact by telephone, and we should be considerate of other people's rights. Complaints are many on the part of fruit growers, particularly those on party lines, with reference to the indiscriminate use of the telephone for lengthy conversations on subjects of no importance whatever. A person is certainly justified in making a complaint when they have important business transactions to make over the telephone to be compelled to wait ten or fifteen minutes, as is often the case, to listen to a lot of idle chatter. We do not feel that social matters should be eliminated, but it seems proper courtesy to other people on party lines to at least confine these conversations to a limited length of time. The use of the telephone has been abused in a great many ways. In large cities the abuse has become so great that in many offices it became absolutely necessary to forbid the use of the telephone for any other purpose than business. We hope that we will not be misunderstood and we believe this suggestion, if adhered to by everyone, will result in more satisfactory telephone service for everybody on all lines.

Editor Better Fruit:

Your December number reached me today, and allow me to say that (possibly with the exception of the fruit packing number) you never put out a better number. Your articles on tree planting and pruning are worth their weight in gold.—Respectfully, C. B. Davis, Minneapolis.

THE Thirty-second biennial session of the Americian Pomological Society will be held in Tampa, Florida, on February 10 and 11, 1911, not on January 31, February 1 and 2, as announced. The society is accepting the invitation of the Florida Horticultural Society and the Tampa Board of Trade, who are to be hosts on this occasion. The date has been changed to take advantage of very much reduced rates from all points north and west of Ohio and Mississippi River gateways. These reduced rates are on sale on Tuesday, February 7, and through tickets may be purchased to the South based on rates from these river gateways, covering a twelve-day period. In New England and the Northeast the winter tourist rates are the only rates available.

This has been practically arranged. Full details will be issued a little later. Prominent among the subjects to be discussed are fruit storage and transportation problems by experts of the United States Department of Agriculture, apple, growing on hill land in the South, co-operation in the marketing of fruits, the latest on fungicides and insecticides, nut culture. Of the sub-tropical fruits, the orange, pomelo, fig and pincapple will receive special attention. These subicets will be treated by recognized authorities. The fruit interests of the South and Southwest will have full consideration.

The Tampa Board of Trade is making elaborate

the South and Southwest will have full consideration.

The Tampa Board of Trade is making elaborate preparations for the entertainment of the visiting pomologists. Excursions by automobile, by boat, train and trolley, designed to show Northerners interesting features of Florida and her products, are being scheduled. An exhibition of Florida fruit and vegetables will be held in Tampa at the same time.

This notice is now presented for the purpose of urging each member to make plans for a brief vacation in the South. He should also interest his neighbor fruit grower in the same project, for the meeting will be one of profit as well as pleasure.

Editor Better Fruit:

Editor Better Fruit:

I want to thank you for the work you did when you issued, in Septemher, 1906, the special packing number of "Better Fruit." Little I thought when I had the pleasure of first studying the styles and ways of apple packing that at this date I should be the proud winner of the silver medal awarded by the management of the First Canadian National Apple Show for the best packed box of apples in competition against twenty-three eompetitors, some of whom came from the largest apple growing section of the West.—Yours very truly, J. Wm. Cockle, Kaslo, B. C.

Editor Better Fruit:

♦ ♦ ♦

A prominent nursery firm, replying to a request of a customer for information, says: "Replying to your favor of the 30th, asking for a guide on trimming young apple trees planted one year, we suggest our Year Book will give you some information. We ean also furnish you one of the Brother Jonatham booklets on pruning, but one of the best things of the kind we know of, and timely, is the "Better Fruit" Magazine, Hood River. Oregon, which shows apple from the time of planting to full orchard development, each stage, season by season. Editor Shepard is a practical orchardist, who made Hood River what it is, and any number of "Better Fruit" is worth more than the subscription price. You will make no mistake in subscribing for such publication because it tells you all about spraying, grading and marketing, and everything of interest—valuable, invaluable."



RIFE RAMS Pump water automatically day or night



The first cost is low, there's no operating expense. Raises water 30 feet for every foot of fall. Fully guaranteed.

If there is a stream, spring or pond within a mile, write for Free Plans, Free Book and Free Trial Offer.

RIFE ENGINE CO. 2525 TRINITY BLDG., NEW YORK



F.W. Baltes & Company invite your inquiries for Printing

SPECIALISTS IN THE ARRANGING AND EXPEDITING OF FINE WORK

Corner of First Bortland, Gregon and Bak Streets

WESTERN FRUIT JOBBERS' ASSOCIATION'S seventh annual convention will be held in the City of Sacramento, California, February 15th to 18th, 1911. Associated with the Western Fruit Jobbers will also be the National League of Commission Merchants, with a membership of about 700 firms, and the International Apple Shippers' Association, with a membership of about 400 firms. These, together with the Fruit Jobbers' 1900 firms will give a total of 1600 of accredited pers' Association, with a membership of about 400 firms. These, together with the Fruit Jobbers' 500 firms, will give a total of 1,600 of accredited firms that will convene at this time. It is safe to assume that because of the number of accredited representatives from each of these firms that at least 1,500 delegates will be present.

From Eastern advices it is confidently expected that 1,500 delegates will be present.

The publicity committee has been sending out 3,500 pieces of advertising matter per week for the last four weeks, each cartoon being suggestive of some phase of the proposed California entertainment.

tainment.

The officers of the association are: John M. Walker, Denver, Colorado, president; Wm. N. Roylance, Provo, Utah, first vice-president; Geo. G. Grupe, Cedar Rapids, Iowa, second vice-president; J. E. Stewart, St. Louis, Missouri, third vice-president; E. H. Royer, Des Moines, Iowa, treasurer: W. D. Tidwell, Denver, Colorado, secretary; W. H. J. Kavanaugh, Chicago, Illinois, sergeant-at-arms.

Directors: John M. Walker, Denver, Colorado, secretary; V. H. D. Royland, Chicago, Illinois, sergeant-at-arms.

retary; W. H. J. Kavanaugh, Chicago, Illinois, sergeant-at-arms.

Directors: John M. Walker, Denver, Colorado, president; W. M. Roylance, Provo, Utah; Geo. G. Grupe, Cedar Rapids, Iowa; J. E. Stewart, St. Louis, Missouri; Joseph Grainger, Lincoln, Nebraska; E. H. Emery, Ottumwa, Iowa; Samuel E. Lux, Topeka, Kansas; C. B. Bills, Sacramento, California; E. E. Merrill, Minneapolis, Minnesota; Geo. W. Gees, Kansas City, Missouri.

Committees in charge of the convention are: F. B. McKevitt, Sacramento, California, chairman publicity; G. X. Wending, San Francisco, California, chairman transportation; Geo. W. Peltier, Sacramento, California, chairman promia, chairman transportation; Geo. W. Peltier, Sacramento, California, chairman financial; C. B. Wilmarth, Sacramento, California, chairman financial; C. B. Wilmarth, Sacramento, California, chairman financial; C. B. Wilmarth, Sacramento, California, Secretary of the convention.

The present program thus far arranged is as follows: Wednesday, February 15th: 8 p. m., official opening of convention; 9 p. m., reception of ladies at Crocker Art Gallery. Thursday, February 16th: 9 a. m., opening of morning session of convention; 2 p. m., card party for the ladies; 7:30 p. m., banquet; 9 p. m., dance. Friday, February 17th: 9 a. m., morning session of convention; 1

p. m., afternoon session of convention; 2 p. m., luncheon for the ladies; 8 p. m., jobbers' official evening at Northern California Citrus Fair and auction of exhibits; 10 p. m., jinks at Elks' Temple. Saturday, February 18th: 2 p. m., trip to Folsom; 8 p. m., theater party. Sunday, February, 19th: Daylight trip down the river to San Francisco.

As additional means of enlightenment and enter-

19th: Daylight trip down the river to San Francisco.

As additional means of enlightenment and entertainment of the Eastern visitors, the California committee has arranged to hold a fair to be known as the Northern California Citrus Fair, during the entire week, February 13th to 18th. This fair will contain ten departments, namely: Citrus, dried fruits, olives and olive oil, almonds, raisins, wine, apples, truck produce, flowers, specials.

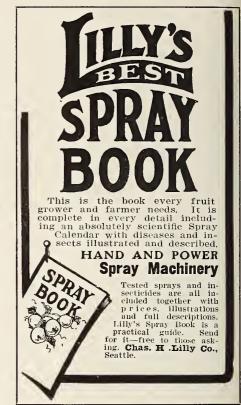
The new Studebaker Building on the corner of Eighth and L, situated in the exact center of the business part of town, has been selected in which to hold the fair, and two floors secured. This building has just been completed. The committee has succeeded in persuading the Studebaker Co. to withhold in warehouse a portion of their stock until after the fair is over.

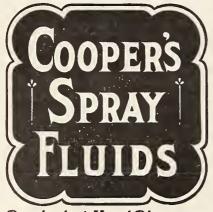
Great interest is being taken in the proposed fair. This is practically the first organized effort that has been made in California to bring the producer and packer in direct touch with the man that markets or buys his crop.

Six excursions will be running to Sacramento by the Southern Pacific Co. The Western Pacific and Santa Fe will run three. The Northern Electric and California Traction Co. are working earnestly in the advancement of the fair, and the advertising will be very general. At least 325 Western newspapers are devoting space to this convention and fair.

One feature that will be brought out by the exhibits in the citrus department will be the great range and length of the citrus belt of Northern California. No exhibits in the citrus lines will be accepted south of the Tehachapi, and starting with the Porterville, Lindsay, Exeter and Dinuba districts, and then jumping to Mt. Campbell, Sanger and Fresno, then showing products of Fair Oaks and Newcastle, then further north to Oroville, Thermalito and Palermo, and finally reaching the upper end of the citrus belt, to Corning and Red Bluff, a distance of over 400 miles due north and south, has been covered. The most southern point shown in these exhibits

in the coast range west of the Sacramento Valley. Sonoma Valley, a beautiful little valley situated. In the matter of decorations, as little bunting as possible will be used. Beautiful effects can be worked out with oranges, clustered raisins and ferns. Over five tons of clustered raisins alone and a carload of oranges have already been obtained for this purpose. No better way can be imagined to impress visitors with the great wealth





Read what Hood River says

Hood River, Oregon, November 27, 1909.
This is to certify that I have used Cooper's
Tree Spray Fluids, VI, for killing San Jose
scale and found it very effectual.
G. R. Castner, County Fruit Inspector.

APTERITE

THE SOIL FUMIGANT DESTROYS INSECTS IN THE GROUND

REDUCES LOSSES SAVES PROFITS IT WILL PAY YOU TO INVESTIGATE Write for 1910 booklet (32 pages) Testimony from fruit growers

everywhere

C. G. ROBERTS

247 Ash Street Portland, Oregon

Sole Manufacturers:

William Cooper & Nephews CHICAGO, ILLINOIS

Wallace Peerless Power Sprayer



PROVEN BEST BY EXPERT TEST

In design, construction, and economy of operation, the PEERLESS spraying outfit is without a peer among power sprayers.

Equipped with our patent pressure regulator, insuring steadiness of pressure, and our new design rotary agitator insuring adequate agitation of spraying mixtures.

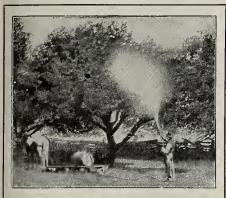
Write for Descriptive Catalogue

AMERICAN SPRAYER COMPANY

Minneapolis, Minnesota

and volume of these products than to see them in this manner.

Many new and novel features will be introduced in the displays. For example, the state commissioner of horticulture has arranged to prepare an exhibit of citrus trees in tubs, upon which the beneficial insects that are bred at the State Insectary will be placed at work. These insects will be confined to the special tree to which they belong by glass "cages."



The Best Spray Pump

Sprays the tallest fruit trees from the ground. Special nozzle for grape vines, shrubs, etc. Sprays quickest and best. Does the work in half the time and does it thoroughly. Always ready. Used with bucket, barrel or 'tank. Lasts a lifetime. No leathers to dry up, wear out, or make trouble.

Standard Spray Pump

Warranted for 5 Years. Price \$4.00.

It will not cost you a cent to try it. Our special offer gives complete details. Write for it today and we will also send our illustrated circular showing how this pump pays for itself many times over the first season.

The Standard Stamping Co.

204 Main Street Marysville. Marysville. O.

The United States Plant Introductory Garden at Chico, the only thing of its kind in America, will exhibit a novel exhibit of tree plant life, which will interest the Eastern visitors.

Luther Burbank, the world's greatest horticulturist, will exhibit some of his wonderful creations. Professor McAdie, in charge of the Pacific Coast department of the United States Weather Bureau, will install and operate a miniature weather bureau, showing the method of advising the orchardists of approaching climatic dangers.

In the flower department the exhibit of Camellias, Sacramento's official flower, which blooms at that season of the year, is bound to attract attention of the visitors from the frozen East.—Contributed.

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Toppenish, Washington, September 23, 1910. Editor Better Fruit:

Your September issue is just before us, and as usual, it is strictly up-to-date. The special packing information is certainly worth far more than the cost of a year's subscription. No fruit grower can scan this issue without being made a far better fruit grower by so doing. Yours very truly,

Washington Nursery Company.

washington Nursery Company.

**\text{\$\lorepsilon\$} \times \times

Morgan, Seattle.

*\Delta \infty \infty \infty

*Editor Better Fruit:

I am this a. m. in receipt of your November issue of "Better Fruit," and am so well pleased with same that I am enclosing a list of live people that if you care to mail one as a sample copy I feel that it will prove of benefit all around.—Yours most sincerely, Robert W. Reist, Portland.

V ARIETIES OF FRUIT on ten-acre orchard of C. H. Hughes, in Pajaro Valley, California: Apples, peaches, oranges, Pondusa lemons, persimmons, ju juby, custard apple, kai apple, eugenia pitanga, guava lucidum, haiephy plum or kaffir plum, pears, quinces, lemons, limes, olives, loquot, strawberry guava, carissa grandiflora, rose apple, guava gunienas, apricots, prunes, grape fruit, figs, ponderosa lemons, mulberries, avocado or alligator pear, casimiroa edulis, fejioa sellowiana, pomegranates, nectarines, cherries and plums. The nuts are English walnuts, black walnuts, butternuts, almonds, chestnuts, pecans, filberts and the macadamia ternifolia or the Queensland nut.

UP-TO-THE-MINUTE SPRAYING SPECIALTIES.



A new Bordeaux
nozzle that cannot
catch on limbs and throws a clean-cut
spray; no ragged edges. An angle-crook
that directs spray any angle. A round-spray nozzle that
throws a solid cone instead of a hollow one and hits the center, not all around it.
Special introductory price to growers.
Agents wanted.

CROWN SPECIALTY CO.

LOCK BOX, 297. CHICAGO

Sales increase yearly; orders duplicated; satisfied users. World's leading all-metal, finest, longest, widest two-spray NOZZLE. Cleaned while using. Twenty-eight years' experience. Inventor built first in U. S. A. Circular?

Nesbar Nozzle Co.

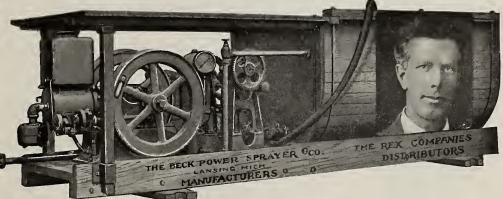
Dept. O

Elmira, New York

THE BECK POWER SPRAYER

Some reasons why you should use a BECK POWER SPRAYER

First-The wide range of capacity possible to secure from the "BECK" line. Our smallest outfit, No. 200, is our Duplex pump and 2-h.p. engine, and has a capacity of 7 gallons of solution per minute. Our Duplex outfit No. 203 has a capacity of 9 gallons per minute and will supply six large round angle nozzles. No. 300, our Triplex outfit, will supply eight angle nozzles with a capacity of 12 gallons per minute. The largest power outfit manufactured is our Triplex No. 304, with a capa-



city of 15 gallons per minute. This machine will supply four open bordeaux nozzles at 300 pounds pressure. Second—We are the first firm to manufacture a line of pumps that will maintain an actual working pressure of 300 pounds. You know that this means more rapid work, and an economy of spray solution that can be obtained in no other way. No danger of breaking the pump, for it is tested to withstand a pressure of 500 pounds before it leaves the factory. The balance of the waterways with the displacement of the plungers and the passage capacity of the valves makes the pumps absolutely free from air cushions, and means that a rapid development of a steady high pressure is

always possible.

Third—We had the only outfit at the National Horticultural Congress, Council Bluffs, Iowa, November 10 to 19, 1910, that could and did take the 30-minute test at a pressure of 300 pounds. In this test the "BECK" was the only machine that ran the full time of the trial without a stop or engine trouble, and it led its class by a score of 15 points over its nearest competitor, in capacity and general operation—the important features of a power outfit.

Mr. Grower, we know that you will want real reliability in your outfit, and we ask for a careful investigation of our machines.

WRITE FOR CATALOG AND PRICE LIST, MENTIONING "BETTER FRUIT"

THE BECK POWER SPRAYER COMPANY, Lansing, Michigan

Editor Better Fruit:

Upon receipt of the first copy of the December edition of "Better Fruit" I telegraphed you in regard to correcting the error that appeared in my article. While this may be no serious mistake, and could hardly lead anyone astray, it will sound rather ridiculous to some of my horticultural friends, for they realize that fruit buds are never injured by the temperatures which appear in the early part of my article as regarding winter injury to ubds.

I will admit that the matter may have been stated rather awkwardly in my manuscript, but whoever is responsible for the change in the reading of the material surely came a long ways from making it read as I wished it to read. In the manuscript, I believe, the temperatures mentioned were, respectively, -10, -15 and -40. This is quite different from 10, 15 and 40 degrees below freezing.

When I telegraphed you, I thought it would be possible to mark the error before the mailing list was sent out, but possibly it was too late for this. Of course mistakes will happen, and I hope you will make note of the error in the next issue.—Yours very truly, O. B. Whipple. Horticulturist. Bozeman, Montana.

HEADQUARTERS FOR

CENTURY SPRAY PUMPS

Hose, Nozzles, Firstclass Plumbing Supplies

C. F. SUMNER

Successor to Norton & Smith

HOOD RIVER, OREGON

WHY MAR THE BEAUTY OF THE LANDSCAPE?

AST summer the editor of "Better Fruit" made a trip to Niagara Falls to visit the International Apple Shippers' Association. On looking out of the car windows throughout many of the middle West and Eastern states, both sides of the farmers' barns were painted with great big ugly signs advertising one thing or another. Great big signboards dotted the country here and there, adding nothing-in fact, detracting much from the beauty of the landscape. The editor is pleased to say that these barn signs are not so general throughout the Northwest, and that big, long signboards are less conspicuous.

It is not our policy to dictate or to interfere with anybody's business, but sometimes we cannot refrain from suggesting things, and I believe that our Civic Improvement Clubs will agree that the thought suggested by this article is well worthy of consideration.

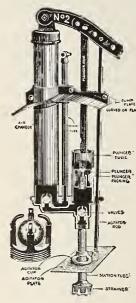
"Better Fruit" wants to see the home grounds improved with flowers, and the buildings attractively painted, but not disfigured with ugly signs. Let us add to nature if we can, but not mar its beauties.

Editor Better Fruit:

A preacher would make a great mess of it trying to preach without a Bible, and, as the Irishman would say, "Be the same token." I can't carry on my business without your valuable paper, "Better Fruit," so please accept the enclosed \$1.00 and continue to keep me on your mailing list. Please change address from R. F. D. No. 8 to 418 South Lincoln Street, Spokane, Washington.—Respectfully yours, J. L. Reynolds, Spokane.



With Hand Spramotors



Mr. Leigh, superintendent, put 40 tons (80.000 pounds) of cold water paint on the N. Y. C. stock yards, Buffalo, New York. When these wonderful hand machines give such ex-cellent satisfaction for big jobs, don't you believe they will do your work well? The Spramotor is guaranteed. In all The Spramotor is guaranteed. In all sizes, for painting, whitewashing, vineyard, weed destruction, orchard and row crops. Tell us what you want the Spramotor for, and the spramotor for, and the spramotor for an all spramotors. we will send you an interesting booklet of 88 pages.

R. H. Heard

1335 Erie St. BUFFALO, N. Y.

Scientific Spray Nozzle

FOR SPRAYING FRUIT TREES, SHADE TREES, ETC.



Nozzle

MADE IN BOTH BRASS AND ALUMINUM

With hard rubber spray directing disc, which is guaranteed to withstand all kinds of chemicals and wear two years. This nozzle fits any spray rod, throws a strong, penetrating spray, but does not drench.

DOES THE WORK OF FOUR NOZZLES AND DOES IT BETTER

And pays for itself in a few hours by saving of spray materials and thorough application of the spray. Secretary C. E. Bassett of Michigan State Horticultural Society says: "We have used the scientific spray nozzle on our farm, and believe it to be the best one used by us, and we have had a good many of the leading kinds. It excels both in the amount of material thrown and the way in which the spray is distributed."

Price \$1.00 postpaid. Money back if not satisfactory after fair trial. A brass ell will be sent for 25 cents additional, with which the nozzle may be placed on the rod at an angle of 45 degrees.

Special prices in dozen lots or over. Live agents wanted.

Write today for catalog and prices on our entire line of Niagara Brand Lime-Sulphur Solution, Niagara Brand Arsenate of Lead, Bordeaux Mixture, Tree Borer Paint, Sulphur, Compressed Air Sprayers, and Gasoline Power Sprayers, Hand Pumps, Nozzles, Spray Rods, Hose and Fittings.

Outlet Disc Spray Directing Disc, made of hard rubber Nozzle body

NIAGARA SPRAYER COMPANY 201 Main Street, MIDDLEPORT, N. Y.



HIGHEST PRICES FOR YOUR APPLES

THAT is what you are after, and there is only one way to command them—grow perfect fruit. There is one way to insure perfect fruit—spray your trees at the exact and proper time with the right spray. The very best you can buy, even if you have to pay a higher price for it than you do for inferior brands. A few extra cents put into a perfect spray will net several dollars in the apple yield. Use a spray that has been proven of the very highest efficiency, and has been adopted by the Apple Growers' Union of Hood River—Niagara Brand Lime-Sulphur Spray.

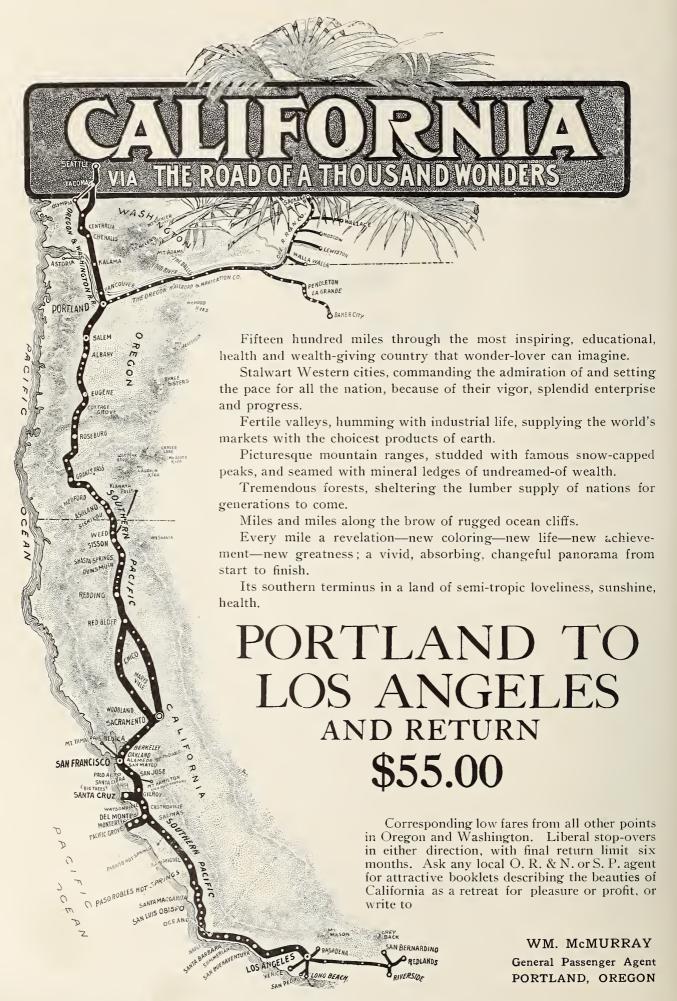
A RSENATE OF LEAD kills leaf-eating insects. You can mix Arsenate of Lead with your Lime-Sulphur and do two sprayings, so to speak, with one operation. The

best Arsenate of Lead you can buy is Niagara and Triangle Brands. They have proven their worth, and have been accepted as without a peer by highly successful Northwest orchardists. Lime-Sulphur Spray is handled exclusively in Hood River by the Apple Growers' Union.

A T reasonable prices, consistent with thorough and excellent operation, we will make contracts with orchardists to attend to all of their spraying. We are exclusive selling agents for Bean spraying machinery. To those interested in the value of sprays and in knowing when to spray, etc., etc., we will send free of charge our booklet, "Successful Spraying." Send name and address to

Hood River Spray Mfg. Co.

309 Failing Building, Portland, Oregon



WHEN WRITING ADVERTISERS MENTION BETTER FRUIT

Something you should know about Arsenate of Lead

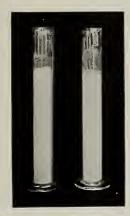


Fig. 1

ALL Arsenate of Lead which meets with the various Government requirements is not of the same kind. There are two distinct forms of Arsenate of Lead, and the object of this advertisement is to show to the grower the difference between these two and enable him to make an intelligent selection of the kind best suited to his needs.

Neutral Arsenate of Lead is composed of arsenic and lead and prepared in such a manner that all the arsenic is thoroughly combined with

lead. This material is very light in gravity, settles very slowly in water, is fluffy and holds a large amount of water and when sprayed on foliage clings very tightly to it. On account of its fluffiness it has great covering power, and because the arsenic is thor-

oughly combined with lead it does not change its composition on exposure to the weather and so will not burn the most delicate foliage.

The second material is the acid Arsenate of Lead, in which only two-thirds of the arsenic is combined with lead, the other third being very loosely combined so as to form a precipitate which is insoluble in water at first, but which on exposure to the weather begins to disintegrate and give free arsenic, which will severely burn tender foliage. This material is much heavier in gravity, not so fluffy, will not hold as much water, settles much more rapidly in a spray mixture, and does not cover the area of foliage so thoroughly on account of its greater density. Such a material is suitable for

spraying forest or shade trees where foliage injury is not quite so important, but it is not adapted for spraying delicate fruit trees.

The photographs in this article illustrate the difference in the two forms of Arsenate of Lead: one is Sherwin-Williams New Process Arsenate of Lead, which is the highest type of an absolutely neutral, thoroughly combined lead arsenate, and the other is one of the typical brands of acid Arsenate of Lead offered in competition at a much



Fig. 2

lower price, which shows very clearly the defects common to this form of Arsenate of Lead.

In the illustration shown by Fig. 1 we have a picture of these two forms of Arsenate of Lead stirred up in water and allowed to settle for fifteen

minutes. The same quantity of paste is used in each case and diluted to the same total volume with water. Fig. 2 shows them after they had stood over night and settled all they could.

After thoroughly settling, the bulk occupied by a given quantity of S-W New Process Arsenate of Lead is approximately 45 cubic centimeters, whereas the competitive material, in the acid form, is 20 cubic centimeters, showing two and one-quarter times the bulk for New Process Arsenate of Lead.

The facts given above plainly show the inadvisability of the orchardist using the cheaper grades on the delicate foliage of his fruit trees. There's no need to take chances. Use the best.

Fig. 3
Fig. 4
Figs. 3 and 4 are micro-photographs

Figs. 3 and 4 are micro-photographs magnified 30 times of a drop from each of these solutions stirred up and placed on glass. Fig. 3 shows that New Process Arser are of Lead covers a given surface more thoroughly than the acid material, leaving no spaces between the particles. We also found that when dry the acid solution rubbed off the glass much easier, showing its adhesive qualities were not so good.

For the Horticulturist and the Fruit Grower there isn't a better spray than Sherwin-Williams New Process Arsenate of Lead. Send for prices on your Spring requirements.



THE SHERWIN-WILLIAMS Co.

MANUFACTURERS OF HIGHEST GRADE INSECTICIDES AND

MAIN OFFICE---707 CANAL ROAD, CLEVELAND, OHIO

This valuable 120-page Book,

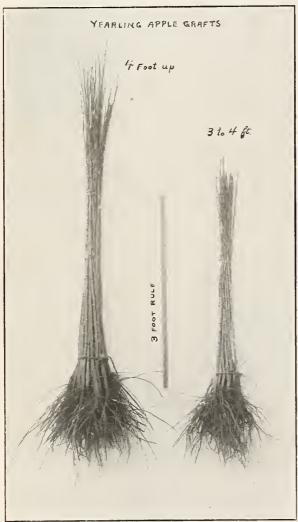
"Spraying—A Profitable Investment,"

SENT FREE



There's the Stock





These are the type of apple trees shipped in fall of 1910 that call forth such remarks as you see here. "SEE THE ROOTS"

Here are Some Comments



Mica, Washington, November 5th, 1910.—A. H. Hoeft: "The consignment of trees arrived today in good condition. I set day of delivery for November 9th at the Chicago Ranch, one mile north of Mica. Trees are the best I ever saw, and I have sold and delivered a good many trees before."

the best I ever saw, and I have sold and delivered a good many trees before."

Enaville, Idaho, November 19th, 1910.—Gust Hagman: "I am fully satisfied with the trees."

Newport, Washington, November 5th, 1910.—C. L. Ford: "Trees are excellent—the best I've seen. Thanks."

Dicks Landing, Washington, November 7th, 1910.—B. F. Bray: "Trees arrived today in good condition. Thanks for your square deal."

Liberty Lake, Washington, November 8th, 1910.—W. A. Mackenzie (Spokane Bridge): "Trees arrived today in good condition. Well pleased. They look fine."

Winthrop, Washington, November 6th, 1910.—Fred Hanny: "The trees I got last year are doing fine."

Laclede, Idaho, November 12th, 1910.—G. W. Dawson: "Trees were fine. Am well pleased. Thanking you for your kindness."

Yamhill, Oregon, November 14th, 1910.—Morris & Graft: "Never saw better trees of their age from any nursery."

Bremerton, Washington, November 21st, 1910.—R. J. Henderson: "Am very highly pleased with the trees."

Portland, Oregon, November, 1910.—Geo. W. Wilson: "I consider this shipment the finest lot of trees I have ever seen. Several fruit growers of that section (Yamhill, Oregon) examined them very carefully, and undoubtedly reached the same conclusion. We compared this shipment with others, and I must say there was not much comparison. The other shipments you sent to Yamhill are giving great satisfaction, and I think you have a foothold in what is bound to be one of the largest and finest fruit growing sections of this country."

Payette, Idaho, November 30th, 1910.—C. J. Hansen: "I find the trees in fine order, and Mr. Kimbal said the best roots he has seen."

Payette, Idaho, November 30th, 1910.—C. J. Hansen: "I find the trees in fine order, and Mr. Kimbal said the best roots he has seen."

Independence, Oregon, December 2nd, 1910.—John Dickinson: "My shipment of trees arrived in good condition. They are just fine stock, and are entirely satisfactory."

Seattle, Washington, November 30th, 1910.—Levi Wright: "I opened the box at West Seattle yesterday morning and found everything in good condition. I do not know how the packing could have been excelled."

Seattle, Washington, December 3rd, 1910.—Eva Binkman: "I am well pleased. Nice trees. Just what I wanted."

Post Falls, Idaho, December 17th, 1910.—L. W. Pietsch, R. F. D. No. 1: "The stock we bought of you last year has done splendidly."

Gooding, Idaho, December 19th, 1910.—I. J. Marcum: "Splendid trees. They are the best rooted trees in their sizes I ever saw. Can't be duplicated anywhere."

Bridgeport, Washington, July 8th, 1910.—I. H. Hess: "The trees I.

Bridgeport, Washington, July 8th, 1910.—J. H. Hess: "The trees I planted this spring, bought from you, are the finest stand I ever saw."

Naples, Idaho, September 19th, 1910.—Wim. B. Roberts: "Your stock was the best in shape and condition of any I have ever purchased."

Kennydale, Washington, August 29th, 1910.—E. Dahl: "The nursery trees I purchased from you are doing fine, and I am well pleased with them."

Renton, Washington, August 28th, 1910.—A. S. Fournier, R. F. D. No. 2: "The trees I got from you last year were all that anyone could wish. They have done fine under the climatic condition this summer."

Manette, Washington, September 24th, 1910.—Oliver Avery: "My trees that I bought of you two years ago look so fine that I refuse others."

Kent, Washington, October 25th, 1910.—J. A. Titus: "This is to certify that the trees I purchased from you to put out in my orchard in 1906 are giving good results, and I am well pleased with them."

Kent, Washington, October 6th, 1910.—E. G. Vashus: "This is to certify that the trees I bought from you five years ago have done very well and the result is excellent."

The originals of these and scores of other similar letters are in our files.

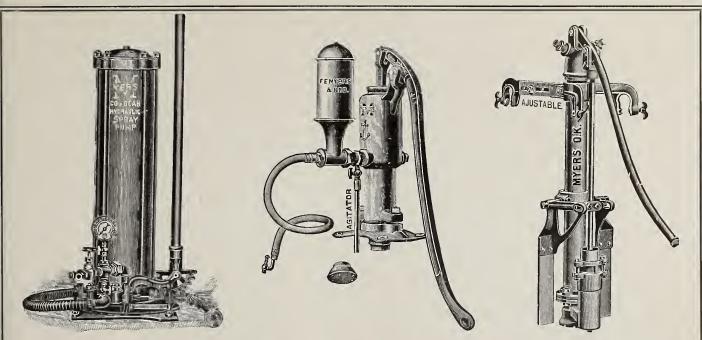
The satisfied customers are building orchards out of the trees, and we are of course glad to feel that we have added another army of satisfied customers to our already long list.

We want your business. We can please you. We grow our stock on soil unsurpassed in fertility and with the advantage of irrigation, long months of sunshine, persistent cultivation and intelligent supervision, we certainly develop trees unequaled in root growth and in vigorous healthy top.

Write Us Your Wants

WASHINGTON NURSERY Co.

TOPPENISH, WASHINGTON



The Purchase of a Myers Spray Pump is a long step toward the raising of Quality Fruit

Of course the next step is the proper and thorough use of the pump, but the point is, that you have the right pump to use. The pump that has been tried out under all sorts of spraying conditions and has been found right. Growers in the Hood River Valley and every section which grows good fruit owe no small credit to Myers Spray Pumps, the pumps that are used by more big growers in the Northwest than any other line made. Thousands and thousands of farmers throughout the United States have found in the Myers the spray pump worth every cent they paid for it, and more. The Myers line is very complete and contains many various styles and sizes. The new Myers Spray Book, showing the entire line, will soon be ready for distribution. If you want one, just use the coupon below.

The Mitchell Power Sprayer

COMPACT SII SATISFACTORY

Improved? Well, we should say so. Just note that platform and think what a convenience it is in spraying big trees. And this is not the only added advantage to be found in the 1911 Mitchell Sprayers. It is more strongly built throughout, the pump is more efficient, and the engine—well, the engine is a two-horse Stover, the simplest, strongest engine made. The agitator is connected by an iron rod to the pump pitman rod, which gives perfect agitation, not too fast or too slow, just right. If, you want our circular on the Mitchell Sprayers check and send in the coupon.



PORTLAND SPOKANE SEATTLE BOISE

ARE YOU INTERESTED?

IF SO, CHECK THE COUPON AND MAIL IT IN

Mitchell, Lewis & Staver Co., Portland, Oregon

Please send me information on lines checked below as advertised in "Better Fruit."

MYERS SPRAY PUMPS MITCHELL POWER SPRAYERS

Name

Address

THE GREAT OBJECTION

Of the average man who wants to own an Orchard Home is the fear of isolation and consequent lack of schools, churches and other advantages to which he and his family have been accustomed

We Have the Best:

Soil, Climate
Water
Scenery
Transportation
Natural
Resources



We do not have:

Killing Frosts
Heavy Snows
Sand Storms
Excessive
Heat
Severe Cold
Malaria

We Have Overcome All the Above Objections

In our subdivision of the magnificent Ashland Orchard Tracts immediately adjoining the Beautiful and Prosperous City of Ashland in the famous Rogue River Valley. A perfect tract of two thousand acres in and adjoining a city of homes and schools in a valley of sunshine and fortune

Plats and Descriptive Matter Upon Request

Ashland Suburban Orchards Syndicate

Ashland, Oregon